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VOLUME 8 NUMBER 2
JANUARY 31, 1989

- 8 CD-ROM Libraries:
Information at Your
(Please Wait)
Fingertips
- 13 Ethernet Cards
Deliver High-Speed
Transmission
For as Little as \$295
- Charles Petzold
On OS/2
Extended Edition:
What Is It?
Who's It For?
- First Looks:
Always Adds
DTP Power to 1-2-3!

Move Over, ANSI.SYS.
PC Magazine's ANSI.COM
Does It Faster, Smarter, Better.

Workhorse ATs

Still Useful After
All These Years:
PC Labs Tests 13
12-MHz 286s



What you've been doing.



*On your 286,
you've been making any task look complicated.*



*On your 386,
it hasn't been incredibly exciting having all that power.*

If the screens on the right look more intriguing to you than those on the left, you're ready for Microsoft® Windows.

Windows opens up the world of visual thinking to all 286 and 386 owners by offering the power of graphics.

Everything you can do on your PC, you can now do better, faster and with greater imagination. Whether you're creating documents or trying to get a clearer picture of your work.

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And once you've learned Microsoft Windows, you'll have the basis for scores of other programs because all the countless new Windows applications are based on the same easy, logical format.

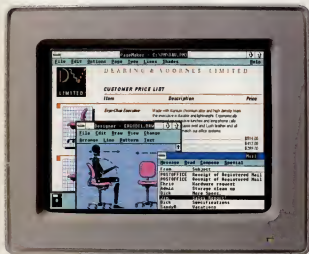
Since Microsoft Windows virtually looks and works like MS® OS/2 Presentation Manager, you won't have to worry about it becoming obsolete in a couple years. We made both systems compatible. So, in the future, you'll be able to share

Stop playing with ancient methods. Now cutting and pasting is a simple point and click with the Microsoft Mouse.

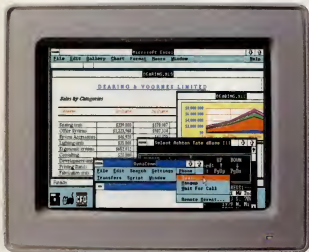
data between them. And your knowledge of Windows will give you a jump on learning MS OS/2 Presentation Manager.

You'd expect a program this powerful to require a more powerful machine. But we consistently create software that makes

What you could have been doing.



With Windows/286,
you could have been seeing things much more clearly.



With Windows/386,
you could have been seeing a lot more things much more clearly.

the best use of your present hardware.

For example, Microsoft Windows/286 will work with as little as 640K and instantly make your machine more sensitive, intuitive and highly visual. It gives you the ability to run every Windows application available.

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Microsoft Windows/386 will give you everything that Windows/286 gives you. Plus multitasking with most DOS applications. Now you can finally utilize the speed and power of any 386 machine.

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WHAT'S INSIDE

Every new technology in the marketplace must make a case for itself to justify its being there at all. In the business and financial world, CD-ROM has had no such problem; its capacity of up to 660MB per disk has earned the technology an enduring position in data storage and retrieval. But when it comes to mass-market applications, both Corporate America and Joe Consumer are asking some hard questions:

Why is CD-ROM read-only? Why is the hardware so expensive when it differs little from CD audio technology? And will we ever see the day when CD-ROM mass data storage achieves the same level of standardization as CD audio?

CD-ROM's *raison d'être* is becoming more apparent every day, especially in view of such recent technological advances as video image manipulation via CD-ROM and the idea of inexpensive, writable optical disks (which are not far off). The time has never been better to take a hard look at some of CD-ROM's more broad-based applications. And in this issue, *PC Magazine* contributing editor Stephen Manes leads the charge into what may be the forefront of tomorrow's data-handling strategy.

Not all products embrace tomorrow's technology; indeed, some deserve recognition simply for their residency in a market that has tagged them all but obsolete. The subject at hand: 12-MHz 286 computers, the focus of our cover story. Suitable

for midrange applications both at the office and in the home, these relatively slow but steady workhorses are proving that when it comes to affordability versus improved performance, the odds are often on their side.

Choosing a computer system is no easy task, and lately another consideration—choice of operating system—has been slipping into the picture to complicate the brand specifier's already formidable task. But OS/2 Extended Edition should neither threaten nor confuse potential users, explains contributing editor Charles Petzold in his stand-alone review. The second manifestation of IBM's new operating system, in fact, may be justified only as Big Blue's solution to a problem it alone faces: the need to integrate its disparate family of current products while remaining mindful of tomorrow's needs.

And in the Productivity section, don't miss ANSI.COM, a memory-resident utility designed to provide greater console control without incurring the performance penalties involved in using IBM's own ANSI.SYS device driver. ANSI.COM enables selectable use of extended screen and keyboard control sequences normally requiring ANSI.SYS. But unlike ANSI.SYS, ANSI.COM supports all video modes, lets you size and clear the key-assignment buffer, and provides high-speed screen updating.

—Edward L. Perratore



Stacking up CD-ROM technology against the competition:
Contributing editor
Stephen Manes . . .



... flouts the equivalent of associate editor Ed Perratore's multivolume Groulier encyclopedia.

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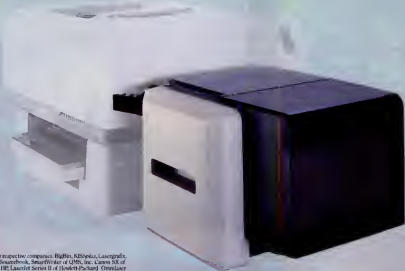
The Canon SX works in the QMS-PS® 810, KISS® plus and HP® LaserJet Series II®. The Ricoh 4150 supports the QMS Lasergrafix® 1510, QMS SmartWriter® 150 and Texas Instruments Omnilar®*, models 2015 and 2115. The Ricoh 4080/4081 series includes the AST TurboLaser®, the DEC LN 03®, and Texas Instruments Omnilar® 2108.

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* Fits Canon SX and Ricoh 4150 engines.

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COVER STORY

Crowd Pleasers: Entry-Level 12-MHz 286s

Bruce Brown and John Dickinson/ Nothing beats a 386 for raw power—yet 286-

powered machines remain the top sellers by filling the needs of an overwhelming percentage of users. Learn why these no-nicks PCs remain at the center

stage of business computing. *PC Magazine* takes a look at the latest crop of 12-MHz 286 workhorses from ALR, Amax, ARC, Austin, Dell, Epson,

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One CD-ROM disk can store the equivalent of 270,000 pages of text.

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- Rewritten CADD king, *AutoCAD*, Release 10, embraces 3-D design
- *JetForm Design*: WYSIWYG forms under *Microsoft Windows*
- *PC-Write* upgrade brings larger files, text columns
- *Superbase 4* relational database package puts GEM's graphics talents to good use
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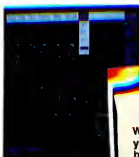
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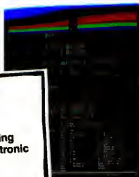
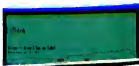
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LETTERS TO PC MAGAZINE



WHITE ELEPHANTS?

Why is there so much discussion about the PS/2s? Personally, I find PS/2s to be lemons. The way I see it, IBM pushed this computer line on the market because it knows that most business administrators who purchase computers for big companies know very little about hardware and software, and they tend to look only at the name of the system. IBM was hoping that its call letters would give the system prestige and that the clone maker would do just that: make clones.

Clarence Jones
Newark, New Jersey

It is unfortunate that Microsoft and IBM chose to expend tremendous resources developing OS/2. A relatively minor investment in adding the Presentation Manager user interface to Xenix would have accomplished virtually the same thing while maintaining some compatibility with the rest of the computer industry. The "not invented here" syndrome strikes again.

Wald Reynolds
Seattle, Washington

SAYING YES TO SAYING NO

I read with utter disgust letters from your readers complaining about *PC Magazine's* running the "Cocaine lies. . . ." ad on the war against drugs (*Letters, PC Magazine*, November 15, 1988). I don't care what industry you are in: drugs are there!

Drugs are a terror infesting our society, and it is everyone's job to do whatever they can to discourage their use. Hats off to *PC Magazine* for carrying an antidrug message. All publications should help fight this war!

Norman D. Tillman
Albany, New York

Maybe in places like Star Prairie, Wisconsin, and Lakewood, Colorado, they don't have a problem with cocaine, but the rest of our country does. If a really good hacker with a cocaine habit to support could transfer funds from one bank to another to feed his addiction, we'd all be in big trouble.

If more companies came out with this message, people would be aware of this problem that affects all of us.

John Buckley
New York, New York

The world has many serious problems, not the least of which are environmental, economic, and social. Hiding one's head in a computer screen isn't helping to solve these problems, but responsible magazines such as yours are. Your readers should have the intelligence to read things like the Partnership for a Drug-Free America ad and take heed.

John N. Membrino
Berwyn, Pennsylvania

No one ever said you had to be intelligent to be interested in computers. *PC Magazine* should be commended for that ad, not criticized.

David Silver
Coral Springs, Florida

A LEGACY TO KEEP

I recently inherited an Eagle PC-Plus computer, with all software missing. At local computer club meetings, I'm met with gales of laughter at its mention and comments like "Use it for a boat anchor" or "Give it to the Russians."

I would, however, like to put it back into operation. If there are Eagle computer junkies out there, please get in touch with

me. It's a nice-looking piece of equipment, and appears to be well built.

Richard B. Naugle
Jonesboro, Arkansas

PRINTING ADJUSTMENTS

There was one important item omitted in your printer review ("The 5th Annual All-Printer Review," *PC Magazine*, October



31, 1988). That item is the maximum paper thickness that the printer is capable of using. There are many of us who need to be able to print on index card stock, and if your presentations included this item, it would be of great value.

Richard Metlen
Culver City, California

I can get all the specs listed in your benchmark tests in a computer store ("The 5th Annual All-Printer Review"). What I cannot get in a computer store is a real-world notion of ribbon longevity. The NEC Pinwriter 2200, for example, even starting with a brand-new (\$12!) ribbon, fades to mouse gray long before it completes printing 30K of text.

PC Magazine should run that test in PC Labs because no computer store, however consumer-friendly, is going to let me do it!

W. F. Bolton
Princeton, New Jersey

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- 384 XY-Solve: (2 disks) Graphic math for HS/college students.

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- 58 Chemview: Rotating 3-D molecular structures. EGA.
- 145 Fingerprint: (2 disks) Paint. Also city oriented disk. ★
- 210 Dancad3D: (2 disks) Advanced design. 640K/1st disk. ★
- 235 Surfmodel: (2 disks) Produce & shade 3-D images. ★
- 356 Geoclock: (2 disks) Time map w/season, dark areas! EGA.
- 372 VGA-Cad: (2 disks) Super nice 256 color painting! VGA.

GAMES

- 15 Biblemen: Encourage knowledge of Bible figures/events.
- 23 Star Trek: Amazing high res! Also Othello, Arillery, EGA.
- 28 Wordplay: (K Wheel of Fortune). Also Backgammon.
- 40 Solitaire: Grit card games. Spider, Klondike, Canfield.
- 121 Arcade: Qubert, Pango, Centipede, Hopper & more! ★
- 151 Hack: You & yr trusty dog in a wild adventure. (K Rogue).
- 176 Striker: Helicopter attack. Also Risk, world domination. ★
- 215 Phrase Crack: Solve word puzzles or create your own!
- 289 3-D Packman: Also Kong, Spacewar, ASM (missile). ★
- 309 Blackjack: (you set rules). Also Asteroid & Empire!
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VIEWPOINTS

LETTERS

AN AUTOMATIC HANDICAP

Ray Smith spoke of DIP switches as if they were an archaic configuration method (Letters, *PC Magazine*, November 15, 1988). The DIP switch configuration is just as easy for the end users as "auto-configuration." This is because the instructions accompany the boards in question with DIP switches, whereas the PS/2 configuration program is hidden in another office somewhere. When it is located, it is still dependent upon the author of the installation instructions.

Andee White
Oklahoma City, Oklahoma

CASH AND CARRY

Contrary to your review, the Bernoulli Box II can withstand 1,000 g's at impact ("Removable Mass Storage: You Can Take It With You," *PC Magazine*, September 13, 1988).

A description in the Editor's Choice box stated that "the disadvantages of the Bernoulli system are its unavoidable media wear and its lackluster speed." After investigating the speed issue, I discovered that your review lab tested the Bernoulli Box II with its verify on, while the others were tested with the verify off. This affected the results.

Imega has added a disk cache to the product that has improved the speed dramatically. In fact, when tested, the Bernoulli Box II improved by 3.9 times and exceeded all other removable storage products tested by PC Labs.

Karen Lippe Brown
Imega Corp.
Palo Alto, California

In line with the PC Labs testing procedures, the benchmark-test figures for each removable mass-media system reflect that system's performance at its default settings.—Ed.

EXTOLLING SUPPLY AND DEMAND

Donald H. Judson notes that oil is "an increasingly scarce commodity in finite supply" (Letters, *PC Magazine*, October 31,

1988). That undoubtedly explains why its price has fallen like hot lava through a glacier in the last 3 years. Or perhaps the pricing of oil is too complex for either John C. Dvorak or a simple Ph.D. in economics like me to understand.

Tony Lima
San Carlos, California

WHOSE REALITY IS IT?

I want to thank Stephen Manes ("Just Tech" vs. Reality: Who Wins?", *PC Magazine*, November 15, 1988) for his column that hinted at the tendency of techies (and the businessmen behind them) to push new hardware and software the way Detroit and Paris push next year's cars and hemlines.

At least one person on your staff seems to disagree with your magazine's apparent attitude of "faster is better, newer is better, and damned be those who don't have the cash to keep up."

Robert Blumenfeld
St. Louis Park, Minnesota

If I understand Stephen Manes correctly ("Just Tech" vs. Reality: Who Wins?"), he believes that the entire space shuttle program falls under his heading of "Just Tech." I personally see a great deal of

■ **Techies and businessmen push new hardware the way Detroit and Paris push next year's cars and hemlines.**

difference between our country's manned space program and the mindless pursuit of technology for technology's sake.

A great number of people work very hard to make sure that the Challenger disaster will never be repeated. For Manes to blindly lump these efforts as "a tweak here, a patch there . . ." is extremely offensive to those of us who do the tweaking and patching.

Brad Mears
League City, Texas

THE BUS STOPS HERE!

CompuStar: PS/2 and PC/AT Compatibility.

Ask any computer expert about what type of system you should buy nowadays and you'll likely get a "pass the bus" response. Something like — "Well, uh, the PC/AT* bus is your best buy but, then again, the new PS/2* bus may become the next industry standard." Great advice, right? If trying to decide on a microprocessor weren't tough enough, now you're expected to pick a bus, too.

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The all new CompuStar from Wells American not only lets you interchange microprocessors, you can also mix and match buses — a PC/AT bus, a PS/2 bus or... both. As your computing needs change, simply snap in a new processor or add an extra bus. You'll never again have to worry about buying the wrong computer system!

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next industry "standard," you'll have peace of mind knowing your investment in a CompuStar will be protected.

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■ LETTERS

CREDITING THE COMPILER

Some technical points were overlooked by the PC Labs testing in the review of Watcom C ("Compiling the Facts on C," *PC Magazine*, September 13, 1988). Watcom C has no restriction on the size of identifiers and each character of an identifier is significant.

Watcom C does have an automatic install program, WVIDEO does list line numbers, and Watcom C comes with a full complement of string functions. The .EXE file sizes for Watcom C 6.5 are better than those in the review. The correct sizes are Files = 27,362, String = 4,756, IMath = 3,416, FMath = 15,872.

Fred Crigger
Watcom Systems
Ontario, Canada

THREE CHEERS FOR JR.

Allan S. Joffe explained that those who purchase IBM products apparently do not shop with their brains, citing the PCjr and the PS/2 Model 50 as "fiascoes" (*Letters, PC Magazine*, October 31, 1988).

My suggestion to Mr. Joffe is that he might want to remember who paved the road to where we are today in personal computing, the ones who created the standard. If he doesn't believe this, take a look at the top line on the outside cover of *PC Magazine*. That should say it all!

Brian L. Holder
Deer Park, Texas

Every time some reader bashes the PCjr, he or she insults computer experts such as Peter Norton and others who wrote some excellent books on the subject. I bought my PCjr in 1984, and I am extremely pleased with it. I can write with it, work on a database, or play games. What else does the jr need to do?

Tom Davison
Los Angeles, California

PINNING DOWN THE TRUTH

John Dickinson made a serious error in describing the operation of a dot matrix printer printhead ("Dot Matrix Printers: The Market Matures," *PC Magazine*, October 31, 1988). He stated that the pins are "held back from the target ribbon and paper by electromagnets" and that when the charge is removed, "the pin is released and the

spring forces it into the ribbon."

The pin is actually held back by a spring. When current is applied to the electromagnet, the magnetic force overcomes the force of the spring, the mass of the pin, and the friction of the pin within the channel. The pin accelerates within the magnetic field and strikes the ribbon. The ribbon

■ I can write with my PCjr, work on a database, or play games. What else does the jr need to do?

is forced into the paper beneath, and a colored spot is left on the paper. When the current is removed, the pin retracts into the printhead.

Lawrence Weiss
Scottsdale, Arizona

The action described in the article is contained in the so-called stored-energy printheads found in most commercially available matrix printers. The type of action you describe is much like that of a solenoid. Matrix printheads that use such a technology are called clapper heads.

CORRECTIONS/AMPLIFICATIONS

The Compaq 386S computer featured in the photo with Stephanie K. Losee (What's Inside, *PC Magazine*, November 15, 1988) was incorrectly identified as the IBM PS/2 Model 70.

The three IBM PS/2 Model 70 computers do not have reset switches ("The Size Is Right: Packing 386 Power into Sleek PCs," *PC Magazine*, November 15, 1988).

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PC Editor's Choice,
86 and '87

■ JOE DESPOSITO

PC ADVISOR



Advice on upgrading PC memory, what's needed to run CGA programs with a NEC MultiSync Plus monitor, and suggestions on learning more about Novell's NetWare.

BUDGET MEMORY UPGRADE

I have an IBM PC with a 256K motherboard, and I need to upgrade my memory by 384K to 640K. I know this is the worst time to even think about upgrading my memory, but what is the cheapest way to do this? I don't need serial/parallel ports and all those extras on the board.

Steve A. Byers
Winchester, Virginia

The board you need to locate is one called a MEM-576 (or similar product name). This is a memory board only and can be used to upgrade PCs from 256K to 640K or even from 64K (the amount of RAM on the original IBM PC system board) to 640K. These boards are sold through mail-order companies such as CompuAdd (12303 Technology Blvd., Austin, TX 78727; (800) 666-1872) and Bentley Computer Products (1700 Still Meadow Cove, Round Rock, TX 78681; (800) 234-4442) for as little as \$35 with no memory installed. To upgrade to 640K from 256K, you would need to purchase nine 41256, 150-nanosecond chips for about \$12 each and eighteen 4164, 150-ns. chips for about \$3 each. Total cost of the upgrade would be about \$197—about as inexpensively as you can do it at the current time.

FOILED BY MULTISYNC PLUS

I have an IBM PC AT that I decided to upgrade so I could perform some serious CAD work. Wanting a reasonable-size display, I opted for the NEC MultiSync Plus monitor and the Everex EV-659 enhanced EGA card, which gave me up to

752 by 410 resolution for CAD work.

Now for the problem. In my enthusiasm, I did not check the monitor's specs too closely. It seemed to work great. Only when I tried running some old programs that use the CGA display mode did I find out that the MultiSync Plus will not operate at a low enough frequency for CGA. I just assumed it did. After all, the NEC MultiSync and the MultiSync II do.

Is there any solution to this problem? Are there any EGA or VGA boards you can recommend that will let me use my MultiSync Plus and my old programs?

Edwin A. Nemeth
Lafayette, California

One way to solve your problem is to contact the companies that sold you your old programs. The question to ask each of them is, Is there an EGA driver available for the program?

If you can't get EGA drivers, you should

■ **Total cost of upgrading PC memory from 256K to 640K would be about \$197—about as inexpensively as you can do it at the current time.**

consider upgrading your video board. In the July 1988 issue of PC Magazine, Winn L. Rosch reviews nine VGA boards. What you need is a VGA board that will emulate IBM's MCGA mode. MCGA has the same resolution as CGA in the graphics mode (320 by 200) but scans at twice the frequency (31.5 kHz vs. 15.75 kHz). Thus, MCGA works on the MultiSync Plus and will run programs that use the CGA display mode.

Two VGA boards from the article that can emulate MCGA are the Paradise VGA Plus Card (Paradise Systems, 800 E. Middlefield Rd., Mountain View, CA 94043; (415) 960-3353), with a suggested retail price of \$399, and the Ultra-Grafix VGA Model 580 Card from Taxan (18005 Cortney Ct., City of Industry, CA 91748; (818) 810-1291), listing for \$395.

LEARNING ABOUT NETWARE

Without any experience, I was put in charge of a network using Novell's NetWare, Version 2.1. It seems to be running smoothly, but I have many questions. Can you recommend any good books on NetWare networking and techniques? Outside of various magazine columns, there seems to be little or no published material around.

Ed Hermann
Mount Laurel, New Jersey

I contacted our workgroup systems editor, Frank J. Dertler, Jr., about this and he explained that practical books on networking software have a very short shelf life. Magazine columns and special issues, like our

■ PC ADVISOR

own *Connectivity Clinic* and the LAN blockbuster, provide the most up-to-date information, as you have already found.

Frank suggests that if you want the best information on Novell's NetWare, you should take a course given by Novell (122 E. 1700 South, Provo, UT 84601; (801) 379-5900). The company gives a variety of courses at facilities across the nation. These courses are the best source of up-to-date information. They also introduce you to other people with similar concerns and to good sources of information within Novell.

FAMOUS LAST SHAREWARE WORDS

In the October 11, 1988, issue of *PC Magazine*, a reader asked about marketing shareware, and you gave him some valuable advice about the shareware alternative.

You also stated that you didn't know of any publication devoted to marketing shareware. I want to let you know that one

of the disks available from the Public (Software) Library (P.O. Box 35705, Houston, TX 77235; (713) 665-7017) is

■ If you want the best information on *NetWare*, you should take a course given by Novell.

the "Shareware Programmer's Guide," which contains a wealth of information on marketing software as shareware. The information on the disk was written by most of the top money-making shareware programmers. The disk is available for \$5.

Additionally, The Public (Software) Library publishes the *PSL News*, a monthly

magazine devoted to testing and writing up all the new releases of public-domain and shareware software.

Finally, for \$10 you can purchase the PD/Shareware Reviews Disks—two disks that contain complete write-ups for a great number of shareware programs (arranged by type of program).

Anyone interested in more information about the Public (Software) Library can obtain a free copy of our monthly magazine by just writing or calling.

Nelson Ford
Houston, Texas

Thanks for the information. I'm sure current and potential shareware authors and users will find it useful.

ASK THE ADVISOR

Send your questions to PC Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016.

SOUNDS FISHY!

Improve The Brooklyn Bridge?

Yes! If you're talking about *The Brooklyn Bridge*™ Version 2 from White Crane Systems. It's the world's leading file transfer, printer sharing and file management utility. It works with all IBM compatible desktops, laptops and Ps/2s. This is not just another fish story! *The Brooklyn Bridge* was chosen by John Dvorak, *PC Magazine*, as "The Best of the Best Utilities."

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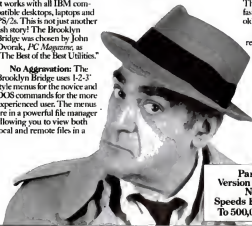
full-screen, dual-directory display. Point-and-shoot operations provide easy disk navigation with over 100 functions like file tagging and sorting.

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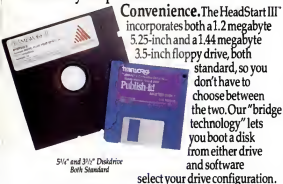
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 SPEED: 10MHz 95 switchable
 BIOS: Award
 BUILT IN RAM: 1 megabyte
 EXPANDABLE TO: 3 megabytes
 POWER SUPPLY: 144 watts 100/120 switchable
 KEYBOARD: 101 key PS/2 compatible
 GRAPHICS: VGA Analog
 FLOPPY DRIVES: one 5.25" 1.2 megabyte, one 3.5" 1.44 megabyte

HARD DRIVE: 32 1 megabyte, 20 millirecords, 5.1 interface
 BUILT IN INTERFACES: Parallel, 2 RS232C serial, analog, joystick
 EXPANSION SLOTS: 5 available
 MOUSE: Standard
 SOFTWARE: DOS 3.3, G.W. Basic, HeadStart Advanced Environment, Floppy Drive Framework II, 3-D Graphics, AT Land Computer-EEZ Tutorial Software, Xstore hard disk manager, Publish-It! Chessmaster 2000, Splash VGA paint program, Breakmark, plus Twist and Shout

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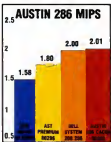
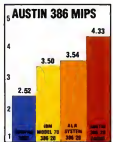
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Supports 1:1 interleaving	YES	NO	NO	YES	NO
4 layer motherboard	YES	NO	NO	NO	NO
640- and 1024-address display adapter	YES	NO	NO	NO	NO
Built-in mouse port	YES	NO	NO	NO	NO
Motherboard made in U.S.A.	YES	NO	YES	NO	NO

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FIRST LOOKS

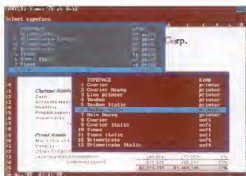
Allways: Add-in Lets 1-2-3 Excel With Presentation-Quality Reports



BY CRAIG STINSON

For well over a year, spreadsheet users who needed to generate gorgeous printed reports from their worksheets have had one product to rely on: *Microsoft Excel*. They've either migrated to *Microsoft Excel* altogether or ported worksheets over from *Lotus 1-2-3* for finishing touches.

The game has changed. Add-in maker Funk Software has just delivered *Allways*, a presentation-quality WYSIWYG print formatter for Lotus



Allways lets you maintain right active fonts at any time. The upper menu (above) lists active fonts, while the lower menu shows fonts that may be activated.

worksheets. In doing so, Funk has not only neutralized a major component of *Excel*'s allure; it's also reduced the incentive for users to switch to any graphics-based spreadsheet program, now or in the future. With *Allways*, users can kick numbers around at top speed in text mode, then toggle into graphics mode at the point where graphics matters most—when it's time to turn the worksheet into a formal presentation.

Like other add-ins, *Allways* stands an Alt-keystroke away from your 1-2-3 worksheet. When you summon the add-in,

(continued on page 34)

New AutoCAD Embraces 3-D Design



BY JEFF PROSISE

Not content to rest on its laurels as the maker of the world's number one microcomputer CAD product, California-based Autodesk has just revamped its venerable *AutoCAD* and outfitted it with a number of enhancements calculated to keep it at the head of the pack.

More a major rewrite than a simple overhaul, *AutoCAD*, Release 10, retains the look and feel of previous versions, with few commands and menu choices thrown in to access its new capabilities. Most notably, Release 10 contains a wealth of powerful new features designed to ease the process of creating and viewing 3-D models. Whereas Release 9 offered only

limited support for 3-D (see "High-End CADD: Expanding to New Dimensions," *PC Magazine*, August 1988), Release 10 embraces it with open arms.

Release 10 contains a new system variable called *FLATLAND*, which controls whether *AutoCAD* behaves as a fully 3-D system or in the quasi-3-D manner of its predecessors. With *FLATLAND* set to 1, *AutoCAD* will accept x- and y-coordinates for the endpoints of a line and will default z-values to the current elevation. With *FLATLAND* equal to 0, the user can directly enter the endpoints' x-, y-, and z-coordinates. Autodesk appropriately bills the *FLATLAND* variable as a "bridge" between the old *AutoCAD* and the new and warns that *FLATLAND* will go away in the next major release.

Also featured in this latest release is the ability to define local coordinate systems and orient them as needed in 3-D space. In Release 10, all *AutoCAD* drawing entities—points, lines, circles, arcs, polylines, splines, and others—are inherently three-dimensional. Using UCSs (User Coordinate Systems), any *AutoCAD* drawing entity can be created at any position and orientation relative to the world coordinate system.

For example, if you want to draw circles representing holes on one surface of an angle bracket, and that surface doesn't lie in orthogonal space, you can simply define a UCS whose spatial orientation matches that of the surface. By making that UCS the current one, any circles you draw are

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AutoCAD

(continued from page 33)

placed in a plane parallel to the UCS's *x-y* plane and at a depth *z* into or away from the plane. This concept is so key to Release 10's scheme for 3-D construction that the UCS command appears prominently in the root menu.

One measure of a 3-D CAD system is the degree of flexibility it offers in manipulating the display. AutoCAD, Release 10, passes this test easily. The new VPORTS command allows the

to draw an adjoining line without breaking continuity. Switching from one active viewport to another is as easy as pointing to the new one and clicking the mouse or digitizer button.


But the most exciting part of Release 10 is its robust support for 3-D surface construction. The three-dimensional polygon entity known as 3DFACE has been around since Release 8, but prior to Release 10 composing an irregular or nonplanar surface in space meant laboriously piecing together three- or

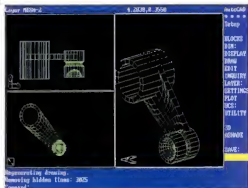
ate surfaces of revolution. EDGESURF draws a Coons patch surface given four edge curves that represent the surface boundaries.

The 3DMESH command generates a surface mesh given a series of points to serve as vertices. Once the mesh is created, AutoCAD offers a mesh-smoothing function under the PEDIT menu that will fit a quadratic, cubic, or Bezier surface to the original polygon mesh.

Once a surface model is created, AutoCAD can display it with hidden lines removed or export it in a format compatible with AutoCAD's companion package, AutoShade. With the variety of surfacing functions offered, virtually any object—2-D or 3-D—can be created with a minimum of time invested.

Among the other new features in Release 10 are an optional extended version of AutoLISP that requires an 80286 or 80386 microprocessor and 512K of extended memory, the ability to make individual edges of a 3DFACE invisible, and increased control over dimensioning entities and their locations. Documentation is excellent and includes a paperback tutorial guide to get you started.

All in all, there's not much to complain about in Release 10. If you liked AutoCAD before, you'll love it now. 



This AutoCAD screen comprises three sections each with a different view of a 3-D mechanical component. Release 10 allows up to four windows.

screen to be divided into up to four viewports. Parameters that affect the AutoCAD display, such as zoom factor and viewpoint, can be set independently in each viewport. As a result, one viewport can show a front view, one a top view, one a side view, and one an arbitrary 3-D view. Viewports can be dynamically updated using a camera/target metaphor. And brand new to Release 10 is the option of perspective viewing, where parallel lines converge to a point on the horizon to give an added appearance of realism.

To a limited extent, drawing operations can be bridged across viewports. If you're drawing a line with more than one viewport displayed and have picked the first endpoint with the on-screen cross hair, you must select a second point from the same viewport. Once the line is drawn, however, you can switch to another viewport

four-sided 3DFACES or creating an AutoLISP program to do the piecing for you.

Not so with the new AutoCAD. Five new commands built into Release 10—3DMESH, RULESURF, TABSURF, REVSURF, and EDGESURF—allow complex surface meshes to be generated automatically from simple bounding curves.

RULESURF generates a 3-D polygon mesh representing the ruled surface that connects any two lines or curves. You could construct a simple cone, for example, by creating a ruled surface between a point and a circle lying in different planes, or a surface resembling a twisted tape by joining two lines with different angular orientations in space. TABSURF creates a surface given one entity that represents a path curve and another that represents a direction vector. REVSURF is used to gener-

Allways

(continued from page 33)

Allways presents your worksheet in graphics mode—provided you have a graphics display—and gives you a new Lotus-style menu to work with. Allways supports Hercules, CGA, EGA, VGA, AT&T, and Toshiba graphics screens; if you don't have one of these, you can still use Allways, but you won't see the effects of your formatting until you print.

The new menu lets you apply additional formatting information to any cell in your worksheet. Allways saves this information in a separate file with the same name as the worksheet but with the extension .ALL.

You can switch back and forth freely between 1-2-3 and Allways as you work, and nothing you do in Allways affects the appearance of your sheet in 1-2-3.

The formatting options available include fonts, boldface, single and double underlining, horizontal and vertical rules, boxes, shading, and changes to column widths and row heights. You can make headings stand out in larger sizes or contrasting typefaces; call attention to particular ranges by adding light or dark shading; use outline rules to separate functional areas of the worksheet; and use the "solid" shading option to create fat underscores, vertical separators, and drop shadows. If your printer can handle color, you can even make elements of your worksheet stand out in contrasting hues.

Allways supports PostScript devices, the HP LaserJet family (including 23 font cartridges), and major dot matrix and ink jet printers. You can use any of your printer's hardware fonts, plus three soft fonts supplied by Allways: Courier, Times, and a Helvetica look-alike. The soft fonts are downloaded to lasers and created in graphics mode on dot matrix printers. You can have up to eight fonts, ranging in size from 5- to 24-point, on a worksheet at once.

As if all this weren't enough to earn Allways a secure spot in



FACT FILE

AutoCAD, Release 10
Autodesk Inc.

2320 Marinship Way
Sausalito, CA 94965
(415) 331-0356

List Price: \$3,000

Requires: 512K RAM (640K RAM if AutoLisp is used); Intel 8087, 80287, or 80387 math coprocessor; hard disk (mouse or digitizer recommended); DOS 2.0 or later.

In Short: A completely new AutoCAD with a wealth of enhancements for 3-D drafting and design. Not copy protected.

CIRCLE 463 ON READER SERVICE CARD

the hearts of 1-2-3 users everywhere, the product takes its DTP skills one step further by incorporating any number of 1-2-3 graphs into your printed reports. All you need do is specify a .PIC filename and a worksheet range and *Allways* will scale the graph to fit the range you designate. For graph text, you can rely on the standard PrintGraph fonts or create ordinary worksheet labels in the graph's output range and format them in *Allways*; the printed graph is transparent, so any underlying text shines through. If you choose to stick with the PrintGraph fonts, you can take advantage of *Allways* options to magnify the text by a factor of from 1 to 3.

Allways also offers a set of printing services derived from one of Funk's other add-ins, *The Worksheet Utilities*. This portion of the program lets you keep any number of printers or printer configurations on-line at any time and switch between them by issuing simple menu commands; in other words, no

over *Lotus 1-2-3's*, bringing the total memory requirements to about 384K. If expanded memory is available, *Allways* will park most of itself there.

If all this sounds like output nirvana, be forewarned: versatile and powerful though *Allways* may be, learning to use it effectively will still take time and effort. You can create documents as complex as a Form 1040, but you won't zap them out in a half hour.

Along with the taste issues that confront any newcomer to "publishing" software, *Allways* presents a couple of learning hurdles all its own. For instance, getting column or report heads properly centered can be a trial-and-error hassle. Spreadsheet programs are not set up for centering text over two or more worksheet columns. *Allways* offers a great improvement over 1-2-3 by allowing centered text that's wider than its column to spill out of the column in both directions instead of just to the right. But since you won't know in advance how wide a heading

in, say, 20-point Times Roman will be, it's difficult to know where to make the center point. To get things just right, you'll probably find yourself fooling with column widths or adding new columns with no data in them. Either way, you may have to readjust the worksheet contents after you've fitted the head.

Drop shadows are nifty, as you'll discover by printing the sample document that comes on the *Allways* disks. But creating them requires you to add two skinny columns and two pygmy rows to your worksheet. Adding rows and columns must be done in 1-2-3 (you can shrink or expand them in *Allways*, but you have to create them in 1-2-3), so these become permanent changes to the worksheet. As such, they will affect the way you look at your data on the screen as well as on paper (you can make the added columns disappear in 1-2-3, but you're stuck with the added rows).

This reviewer's wish list for the next version of *Allways* therefore includes the ability to center text between specified end points and to create drop shadows without having to add columns or rows. Other valuable enhancements would be a print-preview option (so you could see page breaks in advance as well as the relative weight of text and margins) and,

PC FACT FILE

Allways
Funk Software Inc.
222 Third St.
Cambridge, MA 02142
(617) 497-6339
List Price: \$149.95

Requires: 384K; *Lotus 1-2-3*, Release 2 or 2.01; DOS 2.0 or later.

In Short: A *Lotus 1-2-3* add-in that turns ordinary worksheet data into impressive presentation-quality reports. Not copy protected.

CIRCLE 486 ON READER SERVICE CARD

of course, the ability to print "live" graph data as well as frozen .PIC files.

Wish list aside, *Allways* is a truly wonderful add-in. *Lotus* clearly thinks so; the company has agreed to bundle *Allways* with all new copies of 1-2-3, Version 2.01, going out the door (for an unspecified period of time). And, as this issue's Pipeline (see page 40) shows, a lot of current 1-2-3 users think pretty worksheets are quite important, too; *Allways* is getting an even better send-off than Funk's first product, *Sideways*, did back in 1983.

PRINTED Times 20 pt Bold Blue
Font: Boffo Manufacturing Corp.

Boffo Manufacturing Corp.			
Balance Sheet			
January 1, 1989			
ASSETS			
	This Year	Last Year	Change
Current Assets			
Cash	371,829	170,739	118%
Accounts receivable	1,209,113	807,838	50%
Inventory	126,514	68,851	84%
Prepaid expenses	12,034	18,280	-34%
Investments	184,581	38,001	386%
Total Current Assets	1,904,070	1,103,709	73%
Fixed Assets			
Machinery and equipment	188,915	174,603	8%
Vehicles	472,456	219,414	115%
Office furniture	40,192	43,687	-8%
(Accumulated depreciation) *	(80,878)	(77,273)	5%
Total fixed assets	620,685	360,431	72%
	\$2,524,755	\$1,464,140	72%

800-58 04:00 PM

more need to hunt for your LaserJet manual when you want to switch from portrait to landscape mode. You can also create a library of page layout set-ups (margins, page size, headers/footers, and borders) and reuse them effortlessly.

Finally, the program includes commands for importing and exporting formatting information. These facilities allow you to create reusable presentation templates.

Funk lists the memory overhead for *Allways* at about 128K

A standard *Lotus 1-2-3* worksheet, shown via *Allways* on a VGA display (above) and a partial print sample of the exact *Allways* display (right).

Boffo Manufacturing Corp.

Balance Sheet
January 1, 1989

ASSETS			
	This Year	Last Year	Change
Current Assets			
Cash	371,829	170,739	118%
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Vehicles	472,456	219,414	115%
Office furniture	40,192	43,687	-8%
(Accumulated depreciation)	(80,878)	(77,273)	5%
Total fixed assets	620,685	360,431	72%
	\$2,524,755	\$1,464,140	72%

Form: Forms à la Windows

PC HANDS ON

BY JENNIFER ZAINO

Indigo Software's *JetForm Design* is the latest of a new breed of forms generators. The \$495 program makes use of the *Microsoft Windows* interface to provide a WYSIWYG display and graphic import capabilities.

The program comprises two main modules—JetForm Design and JetForm Print for Windows. You'll start off in the Design module, where you can create single- or multiple-page forms using the program's draw and format functions. Included among these are options to create lines of varying thickness and degree orientations, boxes (rounded, shaded, or squared), and circles and arcs that conform to your specified radii.

One of the unique features of the program is its provision for drawing bar code labels as part of the form design or as data fields to be filled in at print time—without the need for special bar code cartridges or soft fonts. Some of the most popular types of formats, including 2 of 5 Industrial, UPC A, and Codabar, are supported.

Text for column headings, form titles, and the like can be entered via the Text Block and Text Label functions. The main difference between the two is that the Text Block option provides a word-wrap capability.

In either case, you have the option to alter the text by changing such factors as typeface and point size (determined by the output device or downloadable soft fonts), justification, x and y margins, and line spacing. The ability to alternate between two different fonts within the same text block is a nice touch.

Like Delrina Technology's *PerFORM* (see First Looks, *PC Magazine*, January 17, 1989), which runs under GEM, *JetForm* allows you to import bitmap raster images (such as logos) into your form. The program directly supports only .TIF files, but it will also accept .PCX, .PIC, and .MSP files once they are run through *JetForm*'s conversion program. As

with *Per:FORM*, *JetForm* lets you import scanned images of preprinted forms (stored in .TIF format) as templates. You can then save time reproducing the form by tracing over the template image.


While the program lets you define data fields to automatically enter such information as current date, time, or page number, it lacks some of the more sophisticated field options found in *PerFORM*. For instance, form designers cannot define a field as mandatory, nor can they define any data validation conditions. Perhaps worst of all, this release does not support mathematical calculations.

The JetForm Print for Windows module is where you'll be

entering your data. In case more than one person will be handling data entry, you can buy additional copies of the *Windows* version or a similar non-*Windows* version—JetForm Print for the PC—for \$199.

A number of printing options are available. You can choose to output a form and the data file you created in the module in field-by-field mode. You can also print the data from comma-delimited files to your form in field-by-field mode. Using overlay mode, you can merge the data of an ASCII file into the electronic form.

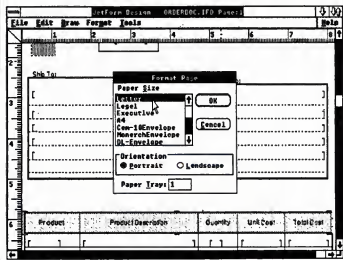
The program has a few implementation flaws that make working with it a hassle. For instance, don't be tempted to look back at your configuration choices. If you view a configuration screen without making a change, the program deselects your choices as you leave, without warning.

JetForm Design includes a number of desirable features, but in its first release, it is still missing elements that could considerably ease the job of the form designer. I'm looking forward to the update. 

List Price: *JetForm Design*, \$495.

Requires: 640K RAM, PC AT or PS/2 or compatible, mouse, DOS 2.0 or later. Includes runtime version of *Microsoft Windows*. Not copy protected. Indigo Software, 560 Rochester St., #400, Ottawa, Ontario K1S 5K2, Canada; (613) 594-3026.

CIRCLE 448 ON READER SERVICE CARD



You design forms in JetForm's design module and fill them in using the Print module. Form page size includes three sizes of envelopes.

Fast Text Searches for \$15

PH HANDS ON

BY EDWARD MENDELSON

MaxFind is a quick and powerful text-searching program that you can find on PC MagNet or a local BBS almost as quickly as it finds text on your disk. Stan Peters's \$15 utility, distributed as shareware, holds its own with the best commercial programs.

Unlike most full-featured text searchers, *MaxFind* works from the DOS command line—

no opening-screen maitre d', no menus, no waiting. Just type MF followed by the text string (or strings) you want to find and a file specification.

You can add command line switches to extend the search into binary files and down through subdirectories, or to make a "fuzzy" search for words that sound like the one you're looking for. You can also include an "any-character" wildcard in the string.

MaxFind lets you include up

to 15 strings in one search, and it will find files that include any one of them or only those files that contain all of them. You can expand the search "window" to find combinations of names and addresses on different lines. And you can redirect the output of the search into a file. Entering MF by itself invokes a help screen.

Compared with Microlytics's *GOfer*, *MaxFind* is about one-third slower at scanning files and, unlike *GOfer*, can't be

used as a TSR. But *GOfer* makes you waste time filling in multiple menus, so *MaxFind* often gets results sooner.

You can download MAXFND.ARC from PC Mag-Net or a BBS. Or send the author \$21 for registration and a disk.

List Price: *MaxFind*, registration, \$15; registration and disk, \$21.
Requires: 64K RAM, DOS 2.0 or later. Not copy protected.
Stan Peters, 4276-C Wilkie Way,
Palo Alto, CA 94306; BBS number:
(408) 735-7190.

CIRCLE 449 ON READER SERVICE CARD

BASICS

Roman
Helvette
Rockland
Chancellor

BASICS II

Roman Italic
Amertype
Big City
Optimis

DECORATIVE

Coop
Abbey
Beget
Oma

BOOK

Garamet
Basque
Centrum
Palatine

SANS SERIF

Avanti
Gillies
Olivia
Galaxy

FIXED

Courier
Prestige
Letter Gothic
Line Draw

On price alone it's a great deal, but there's more, lots more.

Glyphix fonts save you hours of downloading and megabytes of storage because they're generated "on the fly" from within WordPerfect and/or Microsoft Word. Our unique font management software builds drivers and adds them to your standard list of fonts. You simply pick your fonts from the menu and your selections are created and downloaded to the printer when you print your document...in seconds.

And Glyphix fonts will work right alongside any Bitstream and/or Hewlett Packard soft fonts you may already own so once you have our font manager you can go right on saving as you add fonts to your library. That's important because using the right typeface can be as important as choosing the right words. That's why the WordPerfect 5.0 font menu supports up to 256 fonts. They add professional style, impact and just the right tone to your letters, memos,

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from 6 to 60 point*, in portrait and landscape, italic, bold and bold italic for \$149.95. And if you don't already have our WordPerfect or Microsoft Word Font Manager, order one and any set of four Glyphix fonts at our regular price and we'll send you a second set of four fonts, absolutely free! Both of these great offers are good through February 28, 1989.



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*Glyphix fonts require an IBM PC, AT, XT, PS/2 or compatible with 64K RAM; a hard drive; LaserJet Plus, Series II or compatible printer, MS-DOS 2.0 or later. Glyphix lets you print up to 30 point type on a LaserJet Plus and up to 60 pt. on a Series II without additional memory. Glyphix Font Managers are available for Microsoft Word and WordPerfect 4.1, 4.2 & 5.0. Glyphix fonts work with most popular word processing software. Ventura Publisher and Aldus Pagemaker.

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\$89 PC-Write 3.0 Handles Larger Files

PC HANDS ON

BY JONATHAN MATZKIN

PC-Write, from Quickssoft, is one of shareware's great success stories. Despite its modest \$89 registration fee, this word processor offers the kind of features found in the most sophisticated retail software.

The latest upgrade, Version 3.0, adds powerful new capabilities. Perhaps the most important one is the ability to handle files as large as available DOS memory; earlier versions were limited to working with files of up to 60K. Both the editing and print modules are now resident simultaneously, memory permitting. That saves the time it formerly took to load the separate print program and gives the package a more tightly integrated feel.

Version 3.0 also adds a column-editing facility that allows columns to be formatted and edited as separate entities on-screen and stored as separate columns of ASCII text in a single file. This feature makes it possible to lay out basic newsletters, audiovisual scripts, or other simple desktop publishing projects, as long as you don't get too ambitious. Text can't be

snaked from column to column, so you have to manually fill in the columns on each page of a document. I struggled a bit with the column-editing features; everything works fine once you get the hang of it, but, as is the case with many other **PC-Write** features, there is something of a learning curve involved. The sheer number of **PC-Write**'s key-combination commands can seem quite imposing.

Besides column support and larger files, **PC-Write 3.0** offers a barrage of smaller but still significant improvements. Very large documents can be worked

with and stored as a series of linked files. You can use the spelling checker and the search-and-replace functions across these files as if you are working with a single entity.

There is also improved network support, improved menus, and an increase in the number of printer drivers: **PC-Write** now supports over 600 printers.

One of **PC-Write**'s best features is the support that Quickssoft provides. A call to the technical support department about one of the newer features elicited an immediate, knowledgeable answer. The company has

```
Esc:Menu Pool Guide. R:F 99z B/27, 1 Bead "C:\PC\work.doc"
F1:System/help F3:Copy/mark F5:Un-mark F7:Paragraph F9:Find-text
F11:Window/ruler F4:Delete/mark F6:Move/mark F8:Lower/cupper F10:Replace
F12:Print F13:Print-2 F14:Print-3 F15:Print-4 F16:Print-5 F17:Print-6 F18:Print-7 F19:Print-8
PC-Write lets you create multiple columns of text on a page. Then you can edit and format the columns independently. Many operations treat each column as if it were a full page. However, marked blocks and Guide lines span all columns. PC-Write primarily supports parallel columns, for tables, translations, video scripts, etc. Column layout, as for a newsletter, can be done manually on each page. Automatic snaking from one column to another is not supported. There is no fixed limit to the number of columns on a page. You define columns in the ruler line by setting a
```

The variables "PMTN" and "EDT" include a path or file name in a header or footer. "PMTN" is replaced by the current default drive and path name. "EDT" is replaced by the current file name extension. Place two dollar signs (\$\$) before and after the sequence. The sequence can also include date and time variables as in previous versions of **PC-Write**. For example, the following line places the current date, and time in a header line:

```
!H:$$FILETIME Day Mon B, YEAR
Z:MI A.M.$$
```

PC-Write, Version 3.0, offers a sophisticated column manipulation capability. Columns are stored as ASCII text in a single file.



FACT FILE

PC-Write, Version 3.0


Quickssoft Inc.
219 First North, #224
Seattle, WA 98109
(206) 282-0452

List Price: Shareware: no cost if copied from existing user. \$16 for disks only, from Quickssoft. \$89 (with full shareware registration).

Requires: 448K RAM, DOS 2.0 or later. Not copy protected.

CIRCLE 447 ON READER SERVICE CARD

also assembled a catalog of third-party add-on products, like grammar checkers and soft fonts, that have been tested for compatibility.

PC-Write carries the liabilities as well as the benefits that go with most shareware. It doesn't have the slick interface of a *Microsoft Word* or the wonderful ease-of-use of a *PFS:Professional Write*. Both of these limitations make **PC-Write** the wrong choice for novices or computerphobes. But if you are looking for solid, full-featured performance, and you are willing to invest the time to learn the package, **PC-Write** could very well be for you. 

A DTP-Wise Course in Document Design

PC BOOK REVIEW

BY DEAN HANNOTTE

Tom Lichty knows desktop publishers well. We are kids with a new toy, having too much fun to use our DTP toy wisely or well. After we spend 20 hours mixing as many fonts on a title page, we wonder why our readers are rubbing their eyes and gulping aspirins. Lichty's upbeat book *Design Principles for Desktop Publishers* attempts to teach us how to produce attractive, well-designed publications.

Lichty's five basic design concepts are proportion, bal-


ance, contrast, rhythm, and unity. These might equally be applied to the composing of a fugue, but they serve to organize this material well. Covered in detail yet without tedium are fonts, page layout, illustrations, and charts. In case you need to revert to mechanical composition, Lichty explains how to use waxers, rollers, grid sheets, T squares, pica poles, and proportion wheels.

The author also addresses more-general issues at times, making the book not only informative but entertaining as well. You'll learn that although the nation's first newsletter appeared in 1923, over 150,000

are now published regularly, a figure that is growing by 40 percent each year. The brief *Spotter's Guide to Laser Typesets* will teach you how to identify your competitor's fonts. Trivia buffs will learn that Times Roman was designed in 1932 for *The Times* of London and that the "OK" sign is obscene in Germany. The most entertaining, and educational, parts of the book, though, are the funny examples. Many pages are typeset to illustrate with humor the principles they discuss.

A minor flaw: since Lichty wrote his book using Aldus's *PageMaker*, he uses terms like "master page" as if they were

common to all desktop publishing programs. And his complaints about Macintosh bit-mapped fonts will evoke no sympathy from IBM PC users.

Overall, however, *Design Principles for Desktop Publishers* does a nice job of introducing basic design principles to both computer professionals and beginners. It should be required reading for anyone involved with corporate communications. 

List Price: \$19.95, *Design Principles for Desktop Publishers*, by Tom Lichty, \$19.95. ISBN: 0-673-38162-5. Scott Foresman and Co., 1900 E. Lake Ave., Glenview, IL 60025; (312) 729-3000.

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OUR NEW \$249 HAND SCANNER WILL CHANGE THE WAY YOU SEE THINGS.

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The Complete PC

521 Cottonwood Drive, Milpitas, CA 95035 (408) 434-0145 FAX (408) 434-1048.

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CIRCLE 135 ON READER SERVICE CARD



PIPELINE

TOP TEN SELLERS — A 5-Week History



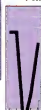
1 Lotus 1-2-3 2.01
Lotus Development Corp.



2 WordPerfect 5.0
WordPerfect Corp.



3 The Norton Utilities Advanced Edition 4.5
Peter Norton Computing



4 Value Pack
Lotus Development Corp.



5 Quicken 2.0
Intuit



6 PC Tools Deluxe 4.3
Central Point Software



7 Turbo C 2.0
Borland International Inc.



8 dBASE III Plus
Ashton-Tate Corp.



9 dBASE IV
Ashton-Tate Corp.



10 Allways
Funk Software Inc.

Rankings are based on net sales by unit; returns are subtracted from gross sales.

IN PERSPECTIVE

The Top Ten Sellers list ranks PC business programs according to their sales performance in the last week of a 5-week period. It also tracks programs' rankings (reading left to right) from October 17 through November 19. A 5-week history is charted to give a sense of a program's sales strength over time. Dramatic shifts in a particular program's ranking may be the result of sales promotions conducted by individual retailers. Seasonal factors, such as end-of-year-budget purchase decisions, can also play a large role in the performance of a particular program in any period. More than 12,000 individual locations contribute to the list.

Sales information compiled by Ingram Software Inc. and PC Connection Inc.



SURVEY

Some of the most impressive demos of a powerful PC in action are manipulations of CADD drawings. Rotations of three-dimensional wireframes are always impressive; zooming in on a single detail in a complex sketch seems like the very heart of power computing.

In planning coverage of products like AutoCAD, Release 10 (see page 33), PC Magazine editors need to understand the many ways that CADD products are used.

Who gets the fun of using such cutting-edge technology? Architects and mechanical engineers are the leaders, but CADD has become important in office management, helping to maximize real estate and minimize moving costs.

These figures are based on responses by 626 callers to PC MagNet, PC Magazine's interactive on-line service.

Do you or your company currently own CADD software?



DOW JONES WILL USE AI ON-LINE

News magazines regularly herald AI (artificial intelligence) and parallel processing as the next wave of computer innovation. The two are often grouped because AI requires so much raw computing power that an expensive parallel-processing system is the only viable way to run an AI application that's more complicated than, say, helping a mechanic diagnose an engine that burns oil.

Precious few of these ambitious applications have left the labs, mainly because of the very high cost of implementing the technology.

One of the first broad-based uses for both will be on public view early in 1989. The Dow Jones News Retrieval service (DJNR) will run a large piece of its vast database on an artificial intelligence engine from Thinking Machines Corp. The computer, called the Connection Machine, employs 32,000 proprietary processors working simultaneously.

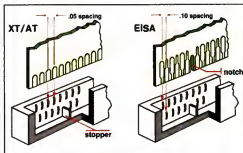
Dow Jones's on-line database is the perfect challenge for AI. Thousands of articles are available for searching. But finding the information you need now can be a frustrating lesson in logic. You have to step through menus that are painfully literal while you're trying to follow

your own instincts.

When the Connection Machine is installed, you'll be able to ask questions in English. For example, "What did Jim Baker say that affected currency trading?" is a valid query that will generate a list of headlines for articles that address your question in one

next try to discern your logic and return a different selection of headlines more closely suited to what you're looking for.

Because all of the articles have to be in RAM, only a part of the entire DJNR database can take advantage of this service. Eight million bytes' worth of articles (including *The Wall Street Journal*, *Business Week*, and *Forbes*) will be available at



EISA Chooses a Double-Decker Edge Connector Design

Members of the EISA committee have rejected the side-connector design originally shown in favor of a deeper slot with two rows of connectors. Existing XT and AT cards will slide in until they meet a stopper. EISA 32-bit cards will have a notch that lets them slide farther down.

way or another. You could narrow your search further by selecting several of these responses as being closer to what you had in mind; maybe, after seeing the initial selection, you realize you want only news affecting the yen, not analysis on the entire situation. The Connection Machine would

first they aren't stored in ASCII, so far more than eight million characters' worth of text will be on-line).

The system doesn't assign keywords to articles; instead it prioritizes every significant word in a story. Aside from prepositions and very common words, each word is put in a look-up dictionary where it's assigned a priority based on frequency.

Dow Jones officials say queries will be answered within 2 or 3 seconds. You'll be able to see if they achieve their goal when the service is made public sometime in late January.

EISA Settles on a Connector

The computer manufacturers backing EISA (Extended Industry Standard Architecture) have settled on a bus connector, and it's a bit different from the design they had been leaning toward when they first announced their planned 32-bit extension to the PC AT bus (see Pipeline,

November 15, 1988).

The new connector employs a double-decker design. EISA connectors will have the same length and width as existing PC AT connectors, but they'll be deeper. Today's boards will plug into the socket until they reach a stopper and will rest there, working as they would in an AT. The 32-bit boards will have a second row of connectors and a notch so they slide farther down into the socket, lining up with a second row of contacts.

This design will use less physical space for connectors on the board, allowing more room for logic circuitry. AMP and Burndy, the leading suppliers of connectors to PC manufacturers, both agree that this design is superior.

Compaq's chief designer, Gary Stimac, said that "initial engineering bread boards" have been tested and he expects the first steel molds to be delivered in late January.

Stimac confirmed that Compaq will sell an EISA computer before the end of 1989 and that, when it's released, Compaq will demonstrate add-on boards that take advantage of EISA's superior data handling.

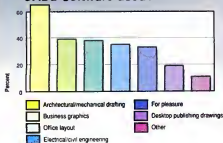
Kevin Mankin, Zenith's product development manager, said that Zenith will also have an EISA machine on sale in the second half of 1989.

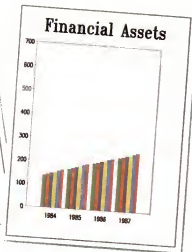
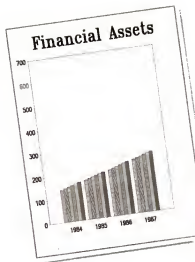
In responding to some views that EISA will become an expensive design suitable only for servers and not for desktop PCs, Stimac predicted that the costs of EISA machines would become comparable to classic bus-based 386s soon after manufacturers are in full production of EISA machines.

"A few extra thousand connectors cost pennies," he said. Of course, Compaq and other EISA manufacturers like Zenith, Hewlett-Packard, and Tandy will need to recoup considerable R&D costs on the first EISA computers before the prices come down.

—Gus Venditto

For which applications is CADD software used?





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CIRCLE 348 ON READER SERVICE CARD

DCA/Crosstalk's Overhauled Remote: Faster Screen Updates, New Features

PC HANDS ON

BY M. DAVID STONE

If you're familiar with remote operations software, you probably know that *Remote* was the trailblazer in the field. Introduced in 1982, it was the first package that would let you call your PC from a remote location and run nearly any program using the remote keyboard and screen.

Alas, *Remote* had the usual shortcomings of first-generation software and was never significantly improved. In *PC Magazine's* last overview of remote operations programs ("Remote Computing: The Next Best Thing to Being There," January 12, 1988), *Remote's* limited features and slow screen updates were painfully obvious.

Enter *Remote²*, a program that shares almost nothing with the original version. DCA/Crosstalk Communications has started from scratch, offering a completely new design.

Like its competition, *Re-*

remote² is actually two packages: a host and a customized terminal emulation program called *R²Call*. *R²Call* provides fully automated calling and log-on features. It also offers a supremely simple menu for controlling such functions as file transfer and which side of the link will print in response to a print command.

File transfer is similar to the Dart protocol found in *Crosstalk Mk. 4* and includes data compression. At 2,400 bits per second, *Remote²* took 2 minutes 47 seconds to send the PC Labs 50K text file from hard disk to hard disk, for a throughput speed of just under 300 characters per second. Even better, the protocol offers recovery from interrupted transfers. If you lose the connection in mid-transfer, you only have to call back and give the transfer command again. *Remote²* will pick up just where it left off.

Another nice touch is that the host can talk to and transfer files with *Crosstalk XVI*, *Crosstalk Mk. 4*, and about a dozen common terminals—including

the IBM 3101 and DEC VT100. This adds flexibility, since you can call the computer with nearly any communications program. However, controlling a PC this way is clumsy, since function keys, Alt keys, and Ctrl keys require escape codes. When calling with *R²Call*, you can use the keys on the remote keyboard just as you would normally.

Be aware that *Remote²* is tailored for two kinds of applications: software support and turning a PC into a central host. For support, the program has a memory-resident mode that will let a user call for help without leaving an application program. A foreground mode will let you designate start-up commands for each entry in the user file. The start-up commands, individual passwords for up to 2,000 users, and a call-back option help make *Remote²* a good choice as a true host system.

Other features in *Remote²* include an activity log, support for CGA graphics, graceful recovery from errors, continuous error checking and correction,

PC FACT FILE

Remote², Version 1.01

DCA/Crosstalk Communications
1000 Holcomb Woods Pkwy.
Roswell, GA 30076
(404) 998-3998

List Price: *Remote²*, \$195;
host, \$129; *R²Call*, \$89. No
charge for upgrade from *Re-*
remote if purchased in 1988. \$60
if purchased before 1988.

Requires: Host software: 256K
RAM, modem, DOS 2.1 or la-
ter. Caller software: 128K
RAM, modem, DOS 2.1 or
later. Not copy protected

CIRCLE 431 ON READER SERVICE CARD

and a screen update speed that is at least tolerable at 2,400 bps. A LAN version should be available by the time you read this.

On the minus side, some features are notable for their absence. In particular, there is no EGA graphics support, though it is promised for a future release.

All told, *Remote²* still has some catching up to do. But it's very much back in the remote-computing ball game.

LaserTools' Trading Post: Teaching Old Software New PostScript Tricks

PC HANDS ON

BY EDWARD MENDELSON

If you dished out thousands of dollars for a PostScript printer only to find that some of your beloved applications don't speak PostScript, take heart. *Trading Post* can translate everyday ASCII print files into PostScript files.

To use *LaserTools' \$79* utility, you set up programs like *dBASE III*, *Lotus 1-2-3*, or almost any tax or accounting software to print to a standard ASCII text printer. When the application sends output to the printer, *Trading Post* intercepts it and adds codes that format the

text for PostScript printing. You can print in landscape or portrait orientation and in any size of any font built into your printer—although *Trading Post* lets you use only one font or font style in each file.

You can print an enormous spreadsheet sideways on a single page by telling *Trading Post* to print in 4-point Courier type in landscape orientation. Or you can produce banners by printing one 700-point letter per page. And your PostScript-aware applications continue to work just as they always did.

When you install *Trading Post* you leave your hardware untouched, but the program creates up to eight imaginary print-

er ports that your applications can write to as if they were writing to eight different printers. *Trading Post* performs different kinds of translation on jobs fed to each port based on your definition of that port. It then directs the output to the printer.

You could define LPT1 as a standard text printer using 10-point Courier. LPT2 can be defined as the port for PostScript-aware applications, whose output will go to the printer unchanged. LPT3 can print in landscape mode. LPT3 could be used for printing in a proportional font, and so on. Each "printer" can have different margins, lines per inch, and orientation.

The utility occupies 7K of DOS memory and works with any PostScript printer, including an HP LaserJet with a PostScript add-in board.

Trading Post doesn't try to translate graphics and, because it won't let you use more than one font per file, it isn't suitable for most word processing. For single-font alphanumeric characters, however, the program does a nice job. If nothing else, it will let you retire that clattering dot-matrix printer you've kept around for your PostScript-aware applications.

List Price: *Trading Post*, \$79

Requires: 7K free memory.
PostScript printer, DOS 2.0 or
later. Not copy protected. *LaserTools Corp.*: 3025 Buena
Vista Way; Berkeley, CA
94708; (415) 843-2234.

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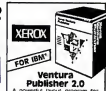
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Crystal: \$995 Expert Systems Package Includes Rule Debugger, Screen Painter

PC HANDS ON

BY RICHARD HALE SHAW

Expert systems, programs that imitate a human expert by asking questions and dispensing appropriate advice, are the latest rage in AI (artificial intelligence). *Crystal*, from Intelligent Environments, gives you everything you need to create your own expert systems.

In order to imitate their human counterparts, expert systems require a knowledge base of information and a facility for "reasoning" with that information. Artificial intelligence pun-

the work entails writing rules like these.

Crystal applications use either *data-driven* or *goal-driven reasoning* (known as forward and backward chaining, respectively). You can use data-driven reasoning when you want to know what kind of outcome should result from a set of conditions. You use goal-driven reasoning when you know the goal and want advice on how to achieve it.

Since the *Crystal* installation program is actually a small expert system, installation is trivial. The documentation is professional and well organized,

The applications development interface is flexible, allowing your application to ask questions from the knowledge base in any order. It can display information to the user at any time. In addition, you can instruct the system when and how to draw and retract conclusions or reevaluate rules. You can export rule conclusions to other applications and can also save the state of a *Crystal* session, restoring it at a later time.

Making Rules

The Rule Editor lets you add rules to a knowledge base using outlining techniques like those found in popular word processors. Each rule is stored in a "dictionary," where it can be looked up and used again. There are no limits to the number of times a knowledge base can reference a rule. When you change a rule's definition, *Crystal* will change all its occurrences. And you can switch between running and editing a rule in a few keystrokes.

Crystal includes a rich collection of over 100 commands and functions, which allow for powerful screen control, data manipulation, and financial and scientific math operations (*Crystal* will use a math co-processor if you have one). There are also extensive text and graphics commands for creating lively, highly interactive user interfaces.

The Rule Tracer/Debugger lets you step rule by rule through a knowledge base, setting breakpoints and examining values. Since well-designed expert systems must justify their conclusions by exposing their logic on command, a key-stroke will display the rules being used at any time.

Crystal doesn't keep any secrets: a knowledge base can be printed or written to an ASCII file at any time. You can also display it in tree-structured form on a graphics monitor or printer.

You can export or import data to and from dBASE, Lotus 1-2-3, and ASCII files.

In addition, a *Crystal* knowledge base can take "snapshots" of virtually anything displayed on your PC's screen for use in an expert system. A runtime environment is available for distributing *Crystal* applications on a large scale. And since extensions to *Crystal* can be written in C, you can expand *Crystal* as needed or use it as a front end for other applications.

Intelligent Environments has spent a great deal of time considering how this software will be used—and it shows. If you have programming experience in C or Pascal, you'll enjoy *Crystal*'s structured approach. If you're a novice, you'll find rule making an easy, nontechnical way to produce powerful applications.

Either way, *Crystal* offers a comprehensive English-language development system and a Rolls Royce of an expert systems shell.

PC FACT FILE

Crystal, Version 3.20

Intelligent Environments

One Village Square

P.O. Box 388

Chelmsford, MA 01824

(508) 256-6412

List Price: DOS version, \$995;

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Requires: DOS version: 350K

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In Short: A comprehensive ap-

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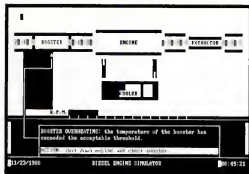
and expert system shell. In-

cludes Rule Editor, Rule

Tracer/Debugger, Screen Paint-

er. Not copy protected.

CIRCLE 448 ON READER SERVICE CARD



Crystal's flexible development tools let you build complex simulators and diagnostic expert systems like the engine simulation above.

dits call a system like *Crystal* a "structured rule-based tool" since the knowledge base you create will consist entirely of rules.

A rule can be a simple English statement, like "IF your salary is greater than \$30,000 AND you have adequate identification, THEN you qualify for credit." A rule's premise can be expanded to include other rules, commands, and functions (perhaps specifying what constitutes "adequate identification"). You don't have to be familiar with expert systems or programming to develop *Crystal* applications, since most of

including a complete reference manual. *Crystal*'s comprehensive "Getting Started" manual is a wonderful tutorial on expert systems, including chapters on building an expert system and knowledge base, designing a user interface, restructuring a knowledge base, and using the Rule Tracer/Debugger facility and Screen Painter.

The *Crystal* interface uses pop-up boxes and menus to select commands, manipulate the knowledge base, and switch between components. A handful of clever demonstration systems that you can study and imitate are included.

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PC 0189

GEM-based Relational Database Manager Links Fields to Graphics

PC HANDS ON

BY DEAN HANNOTTE

GEM is still the only game in town if you want the benefits of a graphical user interface but are determined to stick with an 8088 machine. *Superbase 4*—a new programmable relational database manager—joins the ranks of *Ventura Publisher* and a host of other applications designed to run under GEM.

Superbase 4 is the big brother of *Superbase Personal Relational Database System*, a non-programmable product that scored well in *PC Magazine's* database roundup of April 26, 1988 (see "Relational Databases: Taking the Middle Ground"). Besides adding a powerful BASIC-like programming language with more than 250 commands and functions, this new version contains a forms editor with strong file linking and graphics features.

In addition to all the facilities one would expect from a product designed to compete with the likes of *dBASE* and *Paradox*, *Superbase 4* comes with a few surprises. Records can have hot links to external graphics and text files, a built-in text editor supports mail-merge, VCR-style buttons let you fast forward or rewind your database in a single click, and on-screen forms can incorporate a variety of fonts, background patterns, and colors.

File definitions support three levels of password protection and can be modified easily at any time, and database reorganization is surprisingly swift. Indexes can be maintained for any and all fields and are updated automatically.

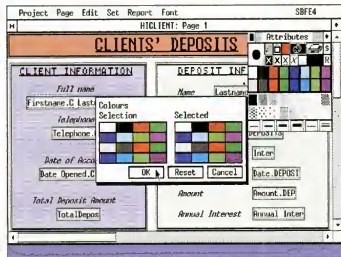
Fields can be text, numeric (with 13-digit precision), date/time, or hot links to .PIC, .PCX, .GEM, .IMG, or text files. They can be required or optional, have an initial default value, be validated by range or table lookup, and be calculated

from functions like SER("myfile"), which returns an integer serially incremented as records are added to the file.

Along the bottom of the screen during file browsing and editing is a control panel of VCR-style buttons that can position you to the first, last, next,

wildcard characters.

The report generator supports page titles and headers and footers, and setting up multicolumn mailing labels is a breeze. Also, you can define "update specifications" that do in *Superbase 4* what global search-and-replace commands do in a



The *Superbase 4* forms editor lets you use a variety of fonts, background patterns, and colors to display records from related files.

and prior records. You can also fast forward, rewind, pause, and stop. Since each record can include a graphic image, fast forward could be used to present an animated slide show of your product line.

You can also position the file by entering a partial key or select a subset of records to work with by defining a filter condition. You can even choose to see only a subset of the fields in each record, a feature that allows a data entry operator to change an employee's address without learning his salary, for example.

Queries can be edited and saved for future use. You can specify record selection criteria, sort order, fields to display, and groups to subtotal, then send your output to the screen, the disk, or the printer. Record selection can be based on data ranges or the LIKE clause, which ignores case and lets you specify a data mask containing

word processor. Colorful multiple page screen forms incorporate images, fonts, and fields from multiple files. You can arrange areas, boxes, lines, text, images, and fields anywhere on a large canvas that extends beyond the borders of the screen. You can print these forms using either the supplied Diablo or Epson drivers, or a driver that you write. Unfortunately, the text fonts off a laser printer look as grainy as if they came from a cheap dot matrix.

The real power of *Superbase 4* lies in its Data Management Language, a superset of BASIC that provides over 250 commands and functions, including two that allow you to customize normally transparent GEM services. With MENU you can replace the pull-down menus at the top of the screen, and with REQUEST you can pop up a variety of generic GEM dialogs, like the one that prompts a user to select a file from a list he can

scroll through. You edit your program in a movable/sizable GEM window using all the facilities of the built-in text editor.

Converting data from an old system to *Superbase 4* will be easy since you can import (and export) data in delimited or fixed-length ASCII files, as well as *Lotus 1-2-3* and *dBASE III* formats.

On-line browsing and edits are done in Record, Form, or Table Views. Record View shows one field per line, one record per screen. Form View adds the ability to rearrange the order and placement of the fields. Table View is unusually weak, since it doesn't allow you to edit records by cursoring to them as you can with almost any other database program. Instead, you have to display a few records at a time, stop when you see a record you want to change, and then request to edit it.

And for a product that requires a graphics card, the absence of data charting and graphing facilities is odd. *Borland's Reflex*, a much less expensive product, offers fine graphing and table editing features, and has better laser printer support too.

All in all, however, *Superbase 4* is powerful, a breeze to learn and use, and surprisingly fast. If you like GEM and need a database package, this product's for you.

PC FACT FILE

Superbase 4

Precision Inc.

8404 Sterling St., Suite A

Irvine, TX 75063

(214) 929-4888

List Price: \$695

Requires: 640K, hard disk, graphics card, mouse, DOS 2.0 or later.

In Short: A GEM-based relational database manager with hot links to graphics and text files, an innovative forms editor, and a powerful integrated programming subsystem. Not copy protected.

CIRCLE 436 ON READER SERVICE CARD

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Still the safest buy in performance optimizers.

As always, Disk Optimizer also gives you the safest, most advanced performance optimization available—proven by over a quarter of a million users.

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A total of 17 different programs.

Disk Optimizer includes *Findfile* for locating files by name or wildcard anywhere on your disk. *Sorts* for rearranging files and directories in the way that makes sense to you. *Lock* and *Unlock* for password-protected file security. *Killfile* for erasing sensitive data permanently. And lots more.

In all, there are 17 different programs in the new Disk Optimizer. Each one designed to improve performance, guard your data, and make disk management easier and simpler for everyone.

So get new Disk Optimizer 4.0, and get more than the courage to say yes. Get the peace of mind and total confidence that your disk is running better and safer all the time.



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- 1.2MB Floppy Disk Drive.
- AT and OS/2 Compatibility.
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- Socket for 80287 Coprocessor.

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NEW ON THE MARKET

by Lori Grunin

Portable WorldPort 2496: 2,400-bps Data, 9,600-bps Fax Modem

Touchbase Systems adds the WorldPort 2496 data/fax modem to its line of soap-bar-sized communications products. The modem, powered by a standard 9-volt battery, combines a 2,400-bit-per-second data modem and a 9,600-bps fax modem in one 1- by 3- by 5-inch (HWD) package.

The 7½-ounce WorldPort has two standard RJ11 phone jacks as well as an acoustic coupler for less-accommodating situations. Modem capabilities include "AT" command set compatibility, auto-dial, answer and rate selection, and a speaker for connection monitoring. The asynchronous modem automatically differentiates between incoming fax and data transmissions.

The WorldPort comes with

communications software that offers unattended sending and receiving for both data and fax transmissions, automatic detection of incoming calls, and scheduled transmission. The Scanner Input Utility supports several scanners, and a file conversion utility handles .PCX, .TIF, and .MAC formats. A view function allows you to enlarge, reduce, rotate, and flip images.

List Price: WorldPort 2496, \$699.

Requires: DOS 2.1 or later.

Touchbase Systems Inc., 160 Laurel Ave., Northport, NY 11768; (516) 261-0423.

CIRCLE 440 ON READER SERVICE CARD



The WorldPort 2496 plugs data and fax capabilities into your serial port.

Desktop Publishing—Quality Reports from Any Database

Digital Composition Systems designed *dbPublisher* to let you create DTP-quality reports with data drawn from popular database and spreadsheet packages.

The program can read and merge data from *dbASE*, *R:base*, *FoxBASE*, and *Clipper*, as well as from spreadsheets like *Lotus 1-2-3*, *Multiplan*, and *SuperCalc 4*. Graphics in .PIC, .TIF, .DIF, .EPS, .PCX, .IMG, and HPGL formats and text from most major word processors are also importable.

The program has a full library of report, mathematical, and financial functions for report generation. It can perform complex sorts, provide situation and special effects control, and output cross-tabulation contingency tables. Links between input files and reports can be created for quick updating of reports.

Some desktop publishing capabilities include WYSIWYG page layout, bar codes, graphics merging, scaling and overlaying, and screen and cross-hatch pattern rule painting. *dbPublisher* offers typographic controls such as paragraph and line leading, automatic kerning pair

(continues on page 52)

Full Text of Computer Magazines On-line

Ziff Communications Co. has begun an on-line service with the text of *PC Magazine* and 47 other computer-related publications and listings from over 80 others. Articles can be searched, read, and downloaded.

Callers to PC MagNet can access the service by typing GO

COMPLIB at any prompt or by selecting the Computer Database Plus option at the main menu. (To join PC MagNet, see the "By Modem" sidebar in Utilities.)

Rates: \$24 connect surcharge, \$1 per abstract, \$1.50 per full text. Ziff Communications Co., One Park Ave., New York, NY 10016; (212) 503-3500.

CIRCLE 446 ON READER SERVICE CARD

HOT PROSPECT

Visual Edge Boosts LaserJet II's Gray Levels, Resolution, Speed

Now that the scanning of complex gray-scale images is reaching an affordable level, Intel's Visual Edge System makes it possible to output them on an HP LaserJet Series II. The \$695 pair of adapter cards can increase laser printer resolution to a maximum of 37 levels of gray at 100 lines per inch (as opposed to the LaserJet's 10 levels), according to Intel.

Enhancement is achieved via Intel's Image Processing Interface (IPI), a specification that controls halftone screening, a process in which the size and pattern of dots are chosen to replace the LaserJet's uniformly patterned ones.

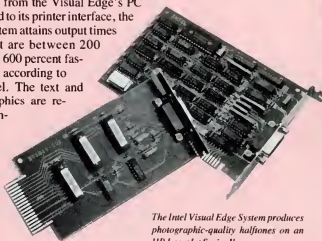
Images and text are sent separately to the printer. Since image data is transferred over the bus from the Visual Edge's PC card to its printer interface, the system attains output times that are between 200 and 600 percent faster, according to Intel. The text and graphics are recom-

bined in the printer adapter.

The Visual Edge uses LIM EMS memory instead of printer memory. The 1MB configuration can handle a full page of line art or a one-quarter-page gray-scale image; a full-page image requires 4MB. For applications that send graphics data to printer memory, Intel includes a utility to redirect the data into expanded memory, freeing the former for font data.

List Price: Visual Edge System, \$695. Requires: 80286/386-based PC, 1MB expanded memory, HP LaserJet Series II, DOS 3.0 or later. Intel Corp., Personal Computer Enhancement Operation, 5200 NE Elam Young Pkwy., Hillsboro, OR 97124; (800) 538-3373.

CIRCLE 437 ON READER SERVICE CARD



The Intel Visual Edge System produces photographic-quality halftones on an HP LaserJet Series II.

NEW ON THE MARKET

dbPublisher

(continued from page 51)

tables, and a font manager. The package comes with 15 typefaces; more can be purchased from a selection that combines 1,000 others.

dbPublisher supports PostScript, LaserJet, or Epson dot matrix printers and compatibles.

List Price: dbPublisher, single-user version, \$695; network version, \$895. **Requires:** 640K RAM, 80286-based PC or PS/2, 20MB hard disk, graphics adapter, Microsoft-compatible mouse, DOS 3.1 or later. Not copy protected. **Digital Composition Systems**, 1715 W. Northern Ave., Phoenix, AZ 85021; (602) 870-7667.

CIRCLE 442 ON READER SERVICE CARD

The Universal Word Offers WYSIWYG Display, Supports All Languages

The aptly named WYSIWYG Corp. enters the high-end word-processing market with *The Universal Word*, a \$695 package that not only generates a WYSIWYG display and a broad range of text-processing functions, but does so for every human language, living or dead.

Other uncommon features include the ability to open as many windows as memory will allow, an 80,000-word definitions dictionary, and a circular find-and-replace function that distinguishes among fonts and languages. *The Universal Word* also performs accent-sensitive search-and-replace in languages other than English.

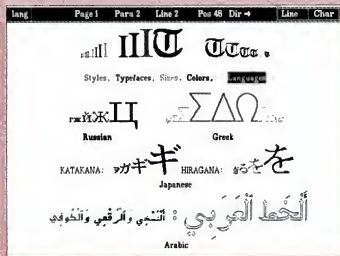
On-screen font display includes outline and shadow, as

well as italic, superscript, subscript, and strikethrough. Unlimited font and color combinations are available within the text, headers, and footers.

The software supports most dot matrix and laser printers (monochrome and color). Custom drivers allow dot matrix printers to produce near-laser-quality output, according to WYSIWYG Corp.

List Price: *The Universal Word*, English, \$695; English with five foreign-language character sets, \$895. **Requires:** 640K RAM, hard disk, EGA graphics, DOS 2.0 or later. Not copy protected. **WYSIWYG Corp.**, 6520 Arizona Ave., Los Angeles, CA 90045; (213) 215-9645.

CIRCLE 438 ON READER SERVICE CARD



The Universal Word can display any font, in any language.

Core Controller Speeds Hard Disk Access In Micro Channel Machines

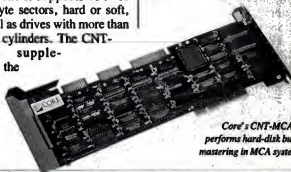
Core International's \$595 CNT-MCA ESDI controller brings hard disk bus mastering to the Micro Channel. The direct memory access controller allows the system to bypass the CPU during hard disk I/O operations. This speeds up the Core CNT-MCA's rate of data transfer to over 1 megabyte per second, according to Core.

The controller features 1:1 interleave and rotational-position sensing for quicker sector location. It supports 256- or 512-byte sectors, hard or soft, as well as drives with more than 1,024 cylinders. The CNT-MCA supplements the standard

hard ST-506 Micro Channel controller for duplexing and mirroring with multiple drives: one machine can support two controllers with four ESDI hard disk drives.

List Price: Core CNT-MCA, \$595. **Requires:** Micro Channel-compatible system, DOS 2.0 or later. **Core International**, 7171 N. Federal Hwy., Boca Raton, FL 33487; (407) 997-6055.

CIRCLE 439 ON READER SERVICE CARD



Core's CNT-MCA performs hard-disk bus mastering in MCA systems.

8514/A-Compatible Graphics Adapters for PCs

Although graphics board manufacturers are still trying to standardize the specifications for extended VGA (800- by 600-pixel resolution), some producers are leapfrogging extended VGA in favor of the IBM 8514/A's resolution of 1,024 by 768 pixels for CAD and other graphics-intensive applications.

Western Digital Imaging's Verticom MX-Series consists of the \$1,695 Verticom MX16/AT and the \$2,095 Verticom MX256/AT; both are 16-bit boards. The MX16/AT's 384K of video memory allows it to display 16 colors, while the MX256/AT can display 256 colors with its 768K of VRAM.

Another entrant into the high-resolution arena is the \$2,195 Rendition II/256 graphics controller from **Renaissance GRX Inc.** The board's 1MB of VRAM and 512K of DRAM

can display 256 simultaneous colors. For an additional \$300, a daughtercard offers a 16-bit VGA chip.

All implement the TI 34010 graphics coprocessor and support 1,024 by 768 resolution in interlaced and noninterlaced modes. They come with drivers for *AutoCAD*, *Releases 9 and 10*, *Microsoft Windows*, and other popular software packages. The boards operate with both analog and frequency-switching monitors.

List Price: Verticom MX16/AT, \$1,695. Verticom MX256/AT, \$2,095. **Western Digital Imaging**, 800 E. Middlefield Rd., Mountain View, CA 94043; (415) 960-3353.

CIRCLE 499 ON READER SERVICE CARD

List Price: Rendition II/256, \$2,195. With 16-bit VGA hardware daughtercard, \$2,495. **Renaissance GRX Inc.**, Cedar Park, 2265 116th Ave. NE, Bellevue, WA 98004; (206) 454-8086.

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\$69.95 PC-Organiser Includes Auto Letter Writer

PC HANDS ON

BY CRAIG STINSON

PC-Organiser is a \$69.95 memory-resident suite of desktop utilities from British vendor Triangle Publishing. Included are a personal calendar, a miniature word processor, a minidatabase, a calculator, an ASCII table, an "automatic" letter writer, and an auto-dialer.

The database has separate facilities for creating field-structured address cards and unstructured note cards. The word processor is good for about five

pages of text. All modules are integrated to the extent that text can be grabbed from one and copied into another.

If this sounds like warmed-over *SideKick/Metro* or the desktop applications that come with *Microsoft Windows*, you've just about got it. **PC-Organiser** brings little new to this party—and the party's been over for a long time, anyway.

The closest thing to an original item in the set is the letter writer. It grabs fielded data from address cards and plugs it into letters according to preset templates. For those who like

that sort of thing, this is the sort of thing they may like.

Unfortunately, user-interface problems abound. Function-key choices appear almost random. (Shift-F2, for example, gets you the main menu.) The Esc key sometimes serves as a backout, sometimes as an error acknowledgment, and at other times as a save-and-quit command. In some parts of the program—the file-import routine, for example—the only way to back out without executing anything is to invoke an Undo command (thoughtfully implemented as Shift-F8). The help

screens are cluttered, and the manual has no index.

On top of all this, the program uses a ton of memory—247K in its full-functioning default mode. Of course, you can run it as a standalone instead of a TSR—but why would you want to?

List Price: *PC-Organiser*, \$69.95.

Requires: 512K RAM, DOS 2.0 or later. Not copy protected. Triangle Publishing Corp., 633 Lomapieta Dr., Aptos, CA 95003; (408) 685-1318.

CIRCLE 433 ON READER SERVICE CARD

QuickPak Professional: A Robust Library of Routines For BASIC Programmers

PC HANDS ON

BY STUART R. GREENBERG

QuickPak Professional, a \$149 library of assembly language and BASIC routines, offers programmers many alternatives to reinventing the wheel.

QuickPak's full library contains routines for—among other things—accelerated screen output, printing of a graphics screen in any mode, sorting of string and numeric arrays, access to directory information, pop-up windows, various types of menus, and mouse support.

While some of these functions are available in other library packages, **QuickPak** provides many unique features. For example, you can create shadows on the pop-up windows by changing the color of the text beneath them to white on black.

QuickPak also offers complex routines that most programmers aren't willing to write. With minor setup and a CALL instruction, an application can include such things as a pop-up ASCII table, a calculator, a file browser, a file editor, a message box, and even a spreadsheet with scientific and financial functions. These rou-

tines can turn an ordinary application into a showstopper.

For the most part, I found the documentation thorough and easy to read. It's sprinkled with suggestions for enhancing and personalizing the routines. I did have some trouble finding the installation procedure but man-

aged to locate it buried within the text on page 7.

Generously commented source code is included for the BASIC routines. The source code for the assembly language routines is available free upon registration if requested.

QuickPak Professional is

available in versions for QuickBASIC and IBM/Microsoft BASCOM Compilers. It's a welcome addition to any programmer's collection of "preinvented wheels."

List Price: *QuickPak Professional*, \$149.

Requires: QuickBASIC or BASCOM Compilers. Not copy protected. Crescent Software, 11 Grandview Ave., Stamford, CT 06905; (203) 846-2500.

CIRCLE 434 ON READER SERVICE CARD

A \$75 Runtime Version of askSam

PC HANDS ON

BY LORI GRUNIN

askSam Systems has cloned the hypertext engine of *askSam*, one of the original textbases, to create *HyperSift*, a \$75 standalone application with all the reporting and retrieval capabilities of its parent program (see "Classified Intelligence: Managing Personal Information," *PC Magazine*, December 13, 1988). *HyperSift* is designed for end users of *askSam* textbases who use them solely for reference and reporting and have no need to modify them.

Not surprisingly, *HyperSift* looks like *askSam* does in hypertext mode. *HyperSift* allows users to retrieve and report (but

not to alter) information in an *askSam* textbase. Its capabilities include executing stored *askSam* programs, backtracking through a list of past queries, and printing reports.

If your textbase was created with the latest version of *askSam* (Version 4.1), *HyperSift* can take advantage of the new features. It can accept user input when executing stored programs and perform global scans—searches across files specified on a menu record.

The program has some annoying quirks. You can never be quite sure what the Esc key will do—it's supposed to show the results of the last scan, but if no such scan exists, it tosses you out of the program. The only documentation is *HyperSift's*

on-line help, which can get confusing since it links several different help files. *HyperSift* doesn't preserve the color settings of a textbase—all revert to white on black.

But these are petty complaints. *HyperSift* provides an effective way to distribute textbases to a large number of people: it harnesses *askSam's* power without inflicting the pain of its steep learning curve.

List Price: *HyperSift*, single copy, \$75; 100 or more, \$15 per copy.

Requires: 256K RAM, *askSam* textbase, DOS 2.0 or later. Not copy protected. *askSam Systems*, P.O. Box 1428, Perry, FL 32347; (904) 584-7481.

CIRCLE 435 ON READER SERVICE CARD

"Most people we meet who give Paradox a try, end up switching to it"

Mark Cook and Steve King, Data Based Advisor



Here's what Data Based Advisor had to say about Paradox:

"You'll find creating a Paradox database easy ... The real test of a DBMS isn't how easy it is to enter your data, but how easy it is to query that data, rearrange it, and perform calculations with it.

"The Paradox Query by Example (QBE) system allows you to easily structure queries from two or more databases ..."

Even novices create applications without programming

"Any Paradox user, even a novice one, can easily use the Personal Programmer to generate menu-driven Paradox applications ... The Personal Programmer works well all the time, even with long, complex applications. We found it can really simplify application development."

"Finally, as the frosting on the applications developer's Paradox cake, it'll only cost you \$9.95 to buy the run-time version of Paradox to distribute [unlimited] copies of your application."

Macros save programming time

"What's really nice about Paradox macros is this: the program records them in the Paradox Application Language (PAL). Once you've recorded a macro, you can name it, save it, and re-use it. But best of all, when you start programming with PAL, you can include your macros as part of your PAL code, really saving programming time."

B O R L A N D

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"You'll find using Paradox on a network is exactly like using the stand-alone version. The real power of the Paradox NetPack shows itself when you simultaneously access a database being used by other people ... The program elegantly handles all the chores of a multiuser database system with little or no effort by network users. Along with allowing you to almost instantly see changes made by other users, Paradox has very powerful automatic record locking features."

Report Generator is a joy to use

"If you've ever suffered with creating dBASE III PLUS reports, you'll find the Paradox Report Generator a real joy to use ... The Report Generator allows you to create headers and footers and to place fields wherever necessary to get the appearance you want."

Paradox is the one we choose!

"One of us is a confirmed Paradox user who has used the software since the beta-version of Paradox 1.0. The other just learned to use Paradox for this evaluation; he's decided to give up dBASE and switch."

Excerpts from Mark Cook and Steve King's review of Paradox in Data Based Advisor, January 1988.

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QuickBASIC 4.5 Adds Hypertext Help



BY ETHAN WINER

With each new release of QuickBASIC, Microsoft improves this powerful BASIC compiler. Version 4.5 is no exception. It builds upon the excellent integrated environment introduced in Version 4.0, adding a powerful on-line hypertext help system. Also bundled with the package is QB Express, an interactive disk-based tutorial meant for beginners.

Beyond simply making QuickBASIC 4.5 easier to learn and use, Microsoft is determined to position QuickBASIC as the logical "next step" for frustrated Lotus 1-2-3 and dBASE users. Of course, BASIC has always been the easiest of the high-level languages to master. Now, BASIC is accessible to anyone with the interest and a few extra hours to spare.

Although few new language features have been added in this release, the user interface has been enhanced considerably. For example, the system menus may be set to show either all of the available choices, or a limited subset that is less intimidating to beginners. Another useful option lets the programmer specify a default search path for executable files, include files,

libraries, and help files.

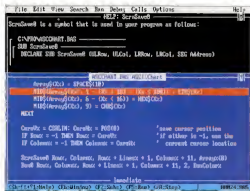
The entire language reference manual is now provided on-disk, though a printed manual is available as an extra-cost option. The disk-based reference contains numerous programming examples, which may be imported directly into the QuickBASIC editor. The two addendum manuals introduced with Version 4.0 are still supplied, and these have been expanded to include information on the new features.

QuickBASIC 4.5 offers a number of welcome improvements for advanced programmers as well. Perhaps the most

important of these is a minimum program size of just under 10K. Contrast that with previous versions, which compiled a program consisting solely of an END statement to a standalone .EXE file larger than 25K.

Another useful improvement is the use of a LINK response file when a program is compiled from within the QB editor. This allows virtually any number of modules to be linked together, rather than limiting you to the length of the DOS command line.

As good as the new on-line help system is, it comes at the cost of requiring more memory.



To use QuickBASIC's hypertext help, you position the cursor on the command in question and press F1. Above, the program displays information about a subroutine.

FACT FILE

QuickBASIC, Version 4.5

Microsoft Corp.

16011 NE 36th Way

Box 97017

Redmond, WA 98073-9717

(206) 882-8080

List Price: \$99; for registered users, upgrade from Version 4.0, \$25; upgrade from earlier versions, \$50.

Requires: 384K RAM, DOS 2.1 or later. Not copy protected.

CIRCLE 461 ON READER SERVICE CARD

For the casual programmer, this may not make much difference, but a large, multimodule program that loaded under QuickBASIC 4.0 may be simply too large for Version 4.5 to handle. Perhaps Microsoft should consider adding an option such as /NOHELP, to tell QuickBASIC 4.5 not to load its help system. And while the on-line manual is convenient, you can't read it on the train or in bed.

In general, QuickBASIC 4.5 is an incremental but meaningful improvement over Version 4.0. Its extensive features, on-line help, and ability to create small .EXE programs clearly proves that QuickBASIC is well suited for both beginning and advanced programmers.

Learning DOS Supports DOS 4.0



BY MARY KATHLEEN FLYNN

For those unschooled in DOS, *Microsoft Learning DOS*, Version 2.0, provides an excellent crash course in the arcane operating system. This version adds a class on DOS 4.0 to the original curriculum. Also new are lessons on batch files, on memory and storage devices, and on the keyboard.

The most computer-ignorant user will be able to follow this

\$49.95 menu-driven tutorial.

The brief manual explains how to get the program loaded. Once on-screen, *Learning DOS* provides definitions so that the newly arrived will soon have basic computer terms—like RAM, hard drives, and databases—under their belts. The product offers lots of hand-holding, like diagrams, "real-world" examples, promptings, help screens, and troubleshooting sections.

If you already know the basics, you can skip around the program to whatever you need

to learn. The program keeps track of your progress, placing check marks beside the sections you've completed on the menu.

Learning DOS includes 28 practice sessions—7 on DOS 4.0. If you choose to proceed "chronologically" through the program, the practice sessions will build upon—and reinforce—what you've already learned. If you make a mistake, you'll be shown where you went wrong and be given another chance to execute the DOS commands.

For neophytes, *Learning*

DOS is ideal. For those who have already mastered earlier versions of DOS and are upgrading to DOS 4.0, *Learning DOS* is probably superfluous. But for those of us who like a refresher course every now and then, *Learning DOS's* on-line DOS Quick Reference, which has been enhanced to support DOS 3.3 and 4.0, is handy.

List Price: *Microsoft Learning DOS*, Version 2.0, \$49.95.

Requires: 256K RAM, DOS 2.0 or later. Not copy protected.

Microsoft Corp., 16011 NE 36th Way, Box 97017, Redmond, WA 98073-9717; (206) 882-8080.

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System Requirements: For the IBM PS/2™ and the IBM® families of personal computers and all 100% compatibles. PC-DOS 3.00/3.01/2.0 or later. IBM VGA Hercules monochrome card or equivalent. 384K. Reflex Workshop requires Reflex. The Analyst. All Borland products are trademarks or registered trademarks of Borland International, Inc. Other brand and product names are trademarks or registered trademarks of their respective holders. Copyright ©1988 Borland International, Inc. 88-1182A

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CIRCLE 281 ON READER SERVICE CARD

PC UPDATE

by Paula Seefeldt

**OmniKey Plus:
A New Layout**

Northgate Computer Systems has added several new features to its keyboard, **OmniKey Plus**. The enhanced keyboard is compatible with 15 different computers and has built-in



OmniKey Plus redesigns keyboard structure.

dual processors and a system reset button. Keyboard layout has been redesigned, and the programs Pourvous and Turbokb are included for improved ease of use. OmniKey Plus retails for \$99. Northgate Computer Systems Inc., Plymouth, Minn.; (612) 553-0631.

**Accel Unveils
Series II**

Accel Technologies has introduced **Series II** versions of **Tango-PCB** and **Tango-Route**, the PC-based electronic design software. The Series II line offers a new interface with pop-up menus, dialog boxes, an on-screen prompt line, "Hot Spots," and a "Speed Palette." Accel has developed the **Tango-Route Series II** auto-router for compatibility with **Tango-PCB**. This auto-router supports the user-definable terms in **Tango-PCB** and also features pop-up menus and dialog boxes. **Tango-PCB Series II** retails for \$595, and **Tango-Route Series II** will continue to sell at the current price of \$495. As an enhancement, both packages include 1 year of free upgrades and a subscription to ACC-EL's quarterly newsletter. Accel Technologies Inc., San Diego, Calif.; (619) 695-2000.

**DataEase
Provides
MultiForms**

DataEase, the application development system from DataEase International, now offers MultiForms viewing and editing to produce forms quickly. Version 4.0 has also improved the DataEase Query Language with 18 new DQL commands. LAN operation now runs up to 500 times faster and each **DataEase** file can hold up to two billion records. Upgrades from Version 2.5 or the LAN Server are \$125. Upgrades from other versions are \$175 and Workstation Pack upgrades are \$150. Retail price is \$700 for a single user or first LAN copy and \$750 for a Workstation Pack. DataEase International Inc., Trumbull, Conn.; (800) 243-5123.

**Microsoft
Delivers
MS-DOS 4.01**

Microsoft is now shipping **MS-DOS, Version 4.01**, complete with improved EMS support and PC-DOS 4.01 compatibility, to manufacturers. The new **MS-DOS** system also includes the DOS Shell, a graphical file-management system that provides pull-down menus and dialog boxes. The retail price for **MS-DOS 4.01** will be determined by the hardware manufacturers. Microsoft Corp., Redmond, Wash.; (206) 882-8080.

**The
Technician
Adds
Indicators**

Equis International has added over 100 new features to **The Technician**, its market-timing software. With Version 5.0, users may now check stock indicators such as the gold/silver ratio, the Japanese yen, the Swiss franc and the Shearson Lehman Bond Index. The manual data entry has been reorganized to match the new **Wall Street Journal** format and to automatically advance to the next record. A Profitability Tester has also been included to test market profitability and data can now be imported to an ASCII file. Upgrades are free to those who purchased **The Technician** after August 31, 1988, and prior to the announcement of Version 5.0. For those who purchased **The Technician** between January and August 1988, upgrades are \$25. Upgrades are \$79 for anyone who purchased the product before 1988. Equis International, Salt Lake City, Utah; (801) 974-5115.

**Ask Dan
Handles New
Tax Laws**

Ask Dan About Your Taxes, the tax preparation program from Legal Knowledge Systems, has been redesigned to comply with the 1988 changes in the tax law. **Ask Dan** has also improved its interface with on-line explanations,

NOTE: For help using the Checklist, press F1 (i.e., "F1" below).			
PART 1 - BUILD CHECKLIST - To build your checklist, move the cursor to (line 1 below, and select "Ask Dan" Answer the "special" questions. Repeat for lines 2, 3, 4, and 5.			
1. Income (line 10)	Checklist	checkboxlist.	
2. Deductions (line 20)	Summary	checkboxlist.	
3. Credits (line 30)	Auditor	checkboxlist.	
4. Other taxes (line 40)			
5. Miscellaneous (line 50)			
PART 2 - USE CHECKLIST - Enter DOB (DOB) for mistakes and planning opportunities. In each form indicated (F1) below. Get to the form by selecting "Tax Forms." or by pressing F8.			
INCLUDE (F8) - "Ask Dan" to review Checklist go. F8 to jump to Form			
Ask Dan Big Picture Tax Forms Summary Print Erase Main Menu			
F1-HELP />TO MENU CURRENT OPEN/Text Entry DOB Available			

Ask Dan
About Your
Taxes pro-
vides checklist
and auditor
features.

an interactive "checklist," an auditor feature that spots mistakes, and pop-up calculator and memo pads. In addition, a "Scenarios" worksheet has been added and error checking is provided for all data. An on-line tutorial is also available. **Ask Dan** retails for \$89.95. Legal Knowledge Systems, Drexel Hill, Pa.; (215) 789-3679.

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COMMUNIQUE

by Bill Howard

ON A BET, HOWIE LINDENMAN, THE OFFICE TINKERER, TRIES LINKING HIS TI CALCULATOR INTO THE WORKGROUP DESKPRO 286/25 NETWORK FILE SERVER.

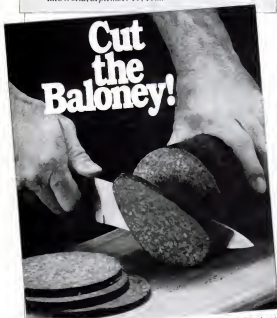


Amazing Facts

"To keep the price low, [IBM's Model 30 286] skimped in two areas: 512K instead of 1 megabyte standard on the motherboard and the 80-nanosecond drives."

—InfoWorld, September 19, 1988

Cut the Baloney!



Here's Northgate's "NO BALONEY" approach to the Computer Business.

As Northgate Computer Systems puts it so aptly in its recent ad, "Here's Northgate's 'no baloney' approach to the computer business." Looks more like salami to us.

Love That Iomega Print Server

"Hutchinson National's first consistent networked system included four IBM PCs and a printer hooked to a Bernoulli Box."

—Computer & Software News, September 5, 1988



Classified Intelligence

"Bleeding Edge, Model D—2 floppy drives, 512K RAM, dual clock speeds, 4.77, 7.2, high-resolution amber monitor, MS-DOS, GW BASIC, Twin included. \$700."

—The Post-Crescent, Appleton-Neenah-Menasha (Wis.), June 21, 1988

A Very Good Year For Microsoft

"Significant product introductions in 1987 include Microsoft Learning DOS and Microsoft Multiplan 3.0."

—"The Best in Electronics" corporate profiles, Micro-soft Corp., Electronic Business, August 15, 1988

Have you seen anything offbeat, unusual, or just plain dumb about the computer industry? If so, then send submissions to *Communications*, PC Magazine, One Park Avenue, New York, NY 10016. Contributors receive \$50 and a PC Magazine T-shirt. In case of duplicate entries, the earliest postmark will prevail. Sorry, but any unused entries cannot be acknowledged.

Winners for this issue: Jon Angel (significant introductions), Richard Curry (Bernoulli network), Bradford Lancaster (80-nanosecond drives).

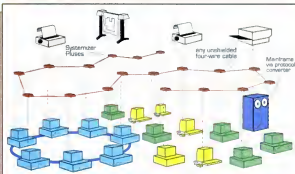
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CIRCLE 112 ON READER SERVICE CARD

■ BILL MACHRONE

PC MAGAZINE: PRODUCT BASHER?



Momma always said, if you don't have anything nice to say, don't say anything at all. So how come we say not-so-nice things about some products?

It's a dilemma.

It started almost 6 years ago, when I was the technical editor of *PC Magazine*. I approached Jon Lazarus, then the editor, and said, "There must be, what, 25 or 30 database products out there. And they're all comparing themselves to *dBASE II*, even though most of them are utterly different. There's no way to make an intelligent choice based on the advertisements."

"So what do you want to do about it?" he asked.

"I want to do a comparison review. Categorize them where it makes sense, then compare them within categories."

"You're going to tee off a lot of people," he said.

He was right. When the smoke cleared, we had discovered 66 database products and invented a new form of computer journalism: the comparison review. Until that time, the style was to find something nice to say about every product, or, as momma advised, to ignore it. Project Database changed all that.

In covering 66 databases, we set a new record for products tested in a comparison review. The previous record was held by *Consumer Reports* for having tested 60 shampoos. Of course, we've gone on to break our own record numerous times, most notably with 120 printers in one of our blockbuster single-topic issues.

Writers in the old days of computer journalism weren't intentionally shilling for products. There wasn't a grand conspiracy to make every product look good. At the time, the range of products was so

new and varied that journalists could find merit in virtually every product. So you seldom heard a discouraging word.

Trade magazines also influenced the process. Trade publications serve people with a particular job title or educational background as a showcase for new products and technologies. The advertisers often write or "place" the articles. Criticizing products in trade publications is considered bad form, biting the hand that feeds you. Oftentimes the editors of trade magazines and journals will invite engineers, designers, and marketers from industry-leading companies to write articles describing new technologies and products. The resulting stories may have technical merit, but they're hardly objective.

Another influence was scientific journals. In these, scientists and engineers publish learned papers on topics of mutual interest. These articles are supposedly without commercial interest, but they are

in fact battlefields on which the combatants slug it out for grant money, promotions, and recognition. In the early days of personal computers, the lines were blurred between commercial companies and research outfits. So the journals of the time bent the rules and printed deep discussions of commercial products by their designers. Some were even couched as reviews.

Publishers and marketers alike still mistake the personal computer market for one that is driven by job titles and departments. They fail to recognize the essentially democratic nature of the PC, its ability to go to work anywhere, at any level. More important, they ignore the ability of an individual in any role to become a key player in a company's PC operations simply by expressing a deep interest and putting in the requisite time to master the field.

COVERING ALL THE BASES The whole point of being comprehensive in selecting products for review is that we try to cover all the entrants in a market or product segment, not just the market or popularity leaders. The up side is that in the course of our digging we discover some gems. Many small companies can't afford press tours, marketing campaigns, or even public relations. Our editorial process tends to flush them out. The down side is that when a magazine reviews the top half dozen products in a market it tends to find nice things to say about each of them. When we review all the products, the differences become more obvious and some products inevitably come up short.

Sometimes even we can't be compre-



Share Printers

Transfer files and a whole lot more with ManyLink.

ManyLink for PCs is the inexpensive software package that lets two PCs (or a PC and a laptop or PS/2) share printers, transfer files and a whole lot more. Just connect the PCs together with the supplied serial cable, install the software, and you can share any printer connected to either PC. All printing and file transfers are done in the background, so both PC

users can continue working even while their files are being printed or transferred.

More than two PCs? *ManyLink for Work Groups* allows up to eight PCs to share printers and transfer files. There's no better way to make your printers and people work more productively.

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All ManyLink products allow users to send short messages with a "CHAT" command, and provide security for sensitive files. NetLine's latest product, *ManyLink for ISDN*, lets you use your ISDN telecommunications system to network your computers, share printers and transfer files. So whether you have two computers, a NetWare network, or an ISDN system, when you think of sharing printers, think of ManyLink.



NetLine

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NetLine products are now available through Micro D.

CIRCLE 147 ON READER SERVICE CARD

■ BILL MACHRONE

hensive. In our annual printer issues, for instance, we review only the new printers shipped that year. Even with that restriction, we still see 90 or more new products each year. The formula, at least in the case of printers, seems to work. Few printers in this marketplace remain unchanged for a full year. The few that are unchanged are either moribund and not of interest or ubiquitous, such as the HP LaserJet Series II, a standard by which all other laser printers are judged.

We also limit the scope of our reviews in other ways. Sometimes it's just common sense. If you're interested in scientific word processing, for instance, you wouldn't want to waste your time reading about all word processors.

We've been accused of being IBM bashers. Some of you will recall a cover photo with a fire ax falling on an IBM PC AT, a variety of Compaq machines dominating their IBM rivals, and headlines that suggested weaknesses in IBM products. You may also recall our unbridled enthusiasm for the IBM PC AT, Editor's Choice and an Award for Technical Excellence presented to several IBM printers. We loved the 8514 monitor, VGA, and the Micro Channel. Most recently, the IBM PS/2 Model 70-A21 won Editor's Choice and was a finalist in our recent Awards for Technical Excellence.

My sense is that we don't bash IBM products so much as the way they're presented. First, the up side: IBM didn't invent the PC; it legitimized it. It came up with the brilliant Little Tramp campaign, which told Everyman that it was OK to own and use a PC. It filled a multiplicity of channels and sold the machines very effectively to businesses.

But old habits die hard. IBM was used to ruling the roost in every market it entered. In its precipitous decline from virtually 100 percent market share to today's 22 percent, IBM has made some strong statements and introduced some strange products. Some strained our credulity. Some insulted our intelligence. In every case, however, we called them as we saw them.

So you may believe that if you don't have anything nice to say, you shouldn't say anything. But in this business, if you have only nice things to say, you're saying nothing.

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CIRCLE 111 ON READER SERVICE CARD

■ JOHN C. DVORAK

MY DINNER WITH IBM



John Dvorak's humiliating dinner with IBM representatives did nothing to lessen his dislike of the Micro Channel architecture . . . and of Big Blue itself.

IBM Corporation Headquarters—Armonk, New York. Offices around the world. Yearly sales: \$56 billion. Profits: \$5 billion. CEO: John Akers.

I didn't want to go to dinner with IBM. It meant killing a Saturday night, finding parking. It meant having to listen to an IBM spiel. *PC Magazine* contributing editor Winn Rosch called; he thought it might be fun. It turned out to be an incredible humiliation for everyone concerned.

It started innocently enough. "Chet Heath wants to talk to you," said Rosch. "He thinks you're an enemy of the Micro Channel." Heath is the father of the Micro Channel. He was being carted around by Linda Dezan, an IBM PR person. Also in attendance was Elizabeth Kniefel, whom Heath had invited along. Kniefel is the producer of the "Computer Chronicles" TV show; she had already had a run-in with Dezan, who had canceled Heath's appearance on the show a few days before a scheduled shoot. Kniefel badgered IBM corporate PR to get someone from IBM to represent the MCA on a show devoted to the subject. Someone relented and here they were in San Francisco.

The horrendous meal scene took place at Doro's in San Francisco, first-class but overpriced and old-fashioned. I sat next to Heath, who explained to me that the Micro Channel was designed for one primary reason—so that conservative buyers of IBM desktop machines would never have to set a switch on an add-in card.

"Most service calls are because some user has his switch settings wrong," said

Heath. He alluded to the fact that clone buyers are generally a smarter class of people than the buyers of IBM stuff and that IBM buyers need all the help they can get. Hence the Micro Channel. This was the tone of the conversation. "It also saves money on printing documentation that tells people how to set the switches," Heath said as he cautioned me *not* to say that cheaper documentation was the motive for the MCA.

Heath's conversation drifted toward IBM boosterism and what a great company it is. "I don't understand why people portray IBM as malicious," he ranted. As he raved I soon sensed IBM's general contempt for its customers, the media, everyone. Its customers were dumb, the press was stupid, and the cloners were cheats.

The dinner began to wind down. Linda Dezan never said anything the entire meal. Just before the check arrived I asked Heath and Dezan for their business cards. Heath

couldn't find his and Dezan didn't bother to look for hers, saying she was "off duty." How professional, I thought.

When the bill arrived, it was shuttled to Linda Dezan, who looked at it and said she wasn't picking up the tab by herself (as is normally the case when a PR type invites people out). The waiter became impatient, as he assumed she was going to split the bill with Chet Heath. Wrong.

Dezan said, "We're not paying this. Get out your credit cards." Needless to say, the five guests of IBM were taken aback, especially Elizabeth Kniefel, who hadn't even brought her wallet. Meanwhile, a group of waiters gathered, wondering what was going on. This attracted the attention of the other patrons, much to the embarrassment of everyone at the table (except for Dezan, who seemed to gloat). The waiters weren't about to divide a bill into seven parts. Not at a place like this. So I grabbed the check and said, "I'll pay it if IBM can't afford it."

Ms. Dezan said there must have been a misunderstanding. "Maybe I can take you to lunch someday."

"Yeah, McDonald's!" I retorted.

Apparently, Heath was also embarrassed by this scene, and I discovered that he somehow talked the staff into giving him the check after we left. The next day Dezan called my answering machine, apologized, and said she picked up the check. She left word that she'd call me the next day to apologize for the whole incident. Three weeks later—still no call.

Like I said: contempt for everyone. Tom Watson would be proud of this crew.



Illustration: Gary Angard

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■ JOHN C. DVORAK

INSIDE TRACK

SAA, CD-ROM, and other slow movers get the needle.

Is Systems Application Architecture (SAA) dead already? That's the indication from various IBM watchers who tell me the users aren't interested in it. SAA, as you recall, is the unified IBM interface standard designed to unite the micro/mini and mainframe world. "It's just not happening," I'm told. There are too many programs that would need recoding for SAA to make an impact. Besides that, it's taking too long to implement, making it look like IBM is dragging its feet.

To me, the loudest bad signal was IBM's signing up with Steve Jobs's NeXT, so that IBM could use his NeXT interface for its AIX/Unix machines and possibly for some others, too. This "Macintosh" interface is as far away from SAA as imaginable. It's obvious that besides not being able to afford dinner (see "My Dinner with IBM"), IBM can't make SAA happen. It's already hedging its bets. We have to assume that there is internal bickering or sudden cold feet. If we ever see SAA, then expect it to have the impact of *TopView*—a previous hallybooded flop.

The Never-Ending CD-ROM Saga: Meanwhile, industry types are interpreting Microsoft's recent dissolution of its CD-ROM group and the movement of its projects into the Microsoft Press division as a sign that CD-ROM isn't happening either. While it makes sense to me that the book people should do the disks, that's not the way others see it. This is compounded by the fact that Microsoft has moved its CD-ROM conference out of Seattle and down to Anaheim "because it's too big for Seattle." The cynics say it's an attempt to back away from the CD-ROM scene because of new developments.

The new developments are CD-XA

(CD-extended architecture), CD-I, (CD-Interactive), and DVI (a fantastic video-on-CD technology recently purchased by Intel from GE/RCA). This means that CD-ROM is quickly becoming a **dead-end technology**.

I know for a fact that Bill Gates is a big believer in the potential of CD-ROM technology. So am I. But its slow start in its current form (plain-vanilla CD-ROM) isn't encouraging. Perhaps Microsoft is partly to blame. The MS-DOS CD-ROM extensions are part of the problem. I don't know who wrote the code, but the installation process is from 1976. If you lose the confused written documentation, there is no way you can install these drivers.

Worse, the extensions **simply don't work** on fast machines. This is ironic since this is a futuristic technology. On a 20-MHz 386 machine I had to run it at 6 MHz to get the CD-ROM to work. I have yet to get the CD-ROM working on my newest 25-MHz 386, despite the fact that all the other software I use works fine.

I was told that the problem is Hitachi: the main OEM supplier of the CD-ROM drive hasn't kept its part of the bargain and isn't telling Microsoft everything it needs to know about the drives. I accepted this at first, but after looking at the confused combination of techie-nerd CONFIG.SYS and AUTOEXEC.BAT loaders dreamed up by Microsoft, I have to conclude that this finger pointing is nonsense. Hey boys, look at the *Super PC-Kwik* cache program to see how to do a driver right and get a hardware guy to look at the thing too!

I've had nothing but trouble with my CD-ROM system and I'm about to give up on it. I don't recommend you spend your energy with this technology unless this mess gets cleared up.

Other New Technologies Dept.:

Want to be an overnight millionaire? Well then sit down and produce a \$499-\$999 optical character recognition software package that does it all. It should be able to read any typeface, tell a row from a column, read mixed fonts, and do it all fast.

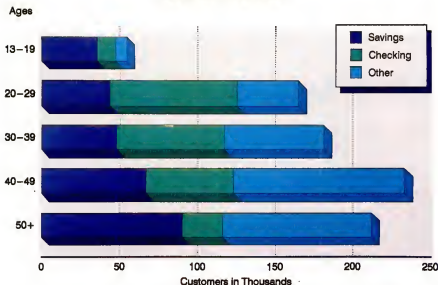
Why no one has produced this has mystified me for years because every software writer I talk to says it's easy. Of course, they're all personally "working on a spreadsheet that is better than Lotus" and therefore haven't the time. The fact is that this is a project that has eluded everyone because it's **too darn hard**.

A recent product breakthrough in the Macintosh arena, though, may change all this. A \$995 product called *TextPert* from CTA Inc. (866 Second Ave., New York, NY 10017; (212) 759-6201) will, when used with a Macintosh and a scanner, read text at a 99.5 percent hit rate. This approaches the current state-of-the-art devices from Kurzweil, whose systems are hardware-software combinations and cost \$10,000 and up. Kurzweil was recently acquired by Xerox, a company known for acquiring healthy firms and letting them flounder, so I figure Kurzweil will be out of the running in no time.

As yet another aside, I love to tell my Xerox story about *Ventura Publisher* (a Xerox acquisition). I wanted to review the thing, but instead of getting a review copy I got a lengthy legal document to sign. In it I had to sign away my rights to sue Xerox if the software somehow killed or injured someone. Why Xerox felt it necessary to make me sign an indemnification clause is still a mystery. I figured if this software was that dangerous, I best not look at it. Fact is, Xerox is hopeless and typical of a company that ran as a monopoly for too long. So the OCR market is wide open.

Finally: Is there any big **oafish** company I haven't offended? ☐

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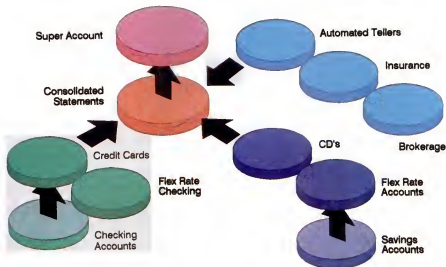
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dec

■ JIM SEYMOUR

THE "D" WORD

"Downsizing"—moving mainframe computing functions to local-area-networked PCs—was scoffed at only a short while ago. Now, everybody's doing it.



Over the past year or so, one topic has been quietly bubbling up to become the hottest and most controversial idea around in planning PC use in large corporations.

That topic isn't Lotus, networks, or workgroup computing; it is *downsizing*. The idea of downsizing—moving formerly mainframe-resident computing functions down to local-area-networked personal computers—first began to warm up about 18 months ago.

I vividly and painfully recall audiences hooting at me when, almost 2 years ago, I began giving speeches about not only the inevitability of downsizing in large companies, but the probability that we'd be well into that process by the end of 1989.

It's no fun being booed when you're giving a speech. And it didn't help much when my antagonists came up later to tell me that they'd liked the talk—although I was hopelessly off-base to think any serious company (much less any serious MIS/DP planner) would even consider such nonsense, let alone be driving the process, in the foreseeable future. And by the end of the eighties? Maybe, just maybe, by the end of the nineties, but . . .

I confess that it's quite satisfying, if still not full recompense, that some of those same people are calling me right now to help plan downsizing projects at their companies.

At the same time, I'm not very surprised by their gross mis-estimate of how long it would take us to get to the point where this kind of downsizing became technologically possible—as well as politically accept-

able to U.S. corporations.

What always fools us about change in the personal computer world isn't the nature of the change, but the *velocity* of that change. We consistently underestimate how fast things will happen. That's exactly what happened here.

Of course, I erred too by thinking we'd only be getting into the process in late 1989. At least I was off by only a year, not a decade.

CAUTIONARY STORIES My experience in downsizing—and like everyone else involved with it, I've had limited experience, since we're still learning and making lots of mistakes—leads me to post several cautions for those about to embark on this path.

One is that you're going to underestimate the time involved to make the cut-over from the large to the small system. That's an easy rule to propound, because

anyone who's been involved in systems work for a while knows that *everything* takes longer than anyone expects. But in downsizing, things take a *lot* longer than you'd expect.

A famous naturalist appearing in a film I directed 20 years ago said on-camera that he so loved the country he was paddling through that he would always give himself lots of time when telling friends when to pick him up: "If I think it's going to take an hour, I say two . . . and I'm never early." I've long used that double-your-best-estimate principle in my computer work. However, when planning a downsizing effort I'd say you should triple, not double, your estimate of the time the process will require.

And you won't be early.

THE STRENGTH OF THE STAFF My second recommendation is to expand the list of people—and thus the range of expertise—you get working on the project. At the least, you'll need a mainframe wizard, a PC wizard, and a LAN wizard on the team. Should you decide, for instance, that Mr. X can be both your PC guru and your LAN guru, you'll more than likely miss the subtle but important inputs you get when a larger number of skilled people are involved in a complex undertaking. And you shouldn't overlook people like data-security experts, office-systems analysts, accountants, even electricians and cable pullers; all of them can have very important roles to play in a smooth downsizing effort.

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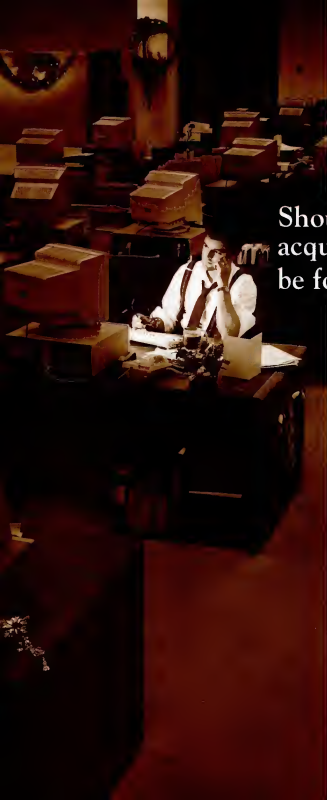
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■ WILLIAM F. ZACHMANN

IBM AT WAR WITH THE WORLD



IBM thought it could eliminate competition by introducing the Micro Channel architecture. The creators of the EISA bus don't agree.

The Great Bus War between the Micro Channel architecture (MCA) from IBM and the Extended Industry Standard Architecture (EISA) from everybody else is likely to be the single most important hardware conflict of 1989. The battle really is over who controls future standards for the most widely used personal computers in the world.

It all started with IBM's attempt to solve a serious problem it was having with personal computers: competition. The Micro Channel architecture was, first and foremost, IBM's attempt to eliminate as much competition as possible from other vendors of personal computers built around the dominant Intel microprocessor architecture.

The problem has three causes. The first is that IBM corporate management failed to understand, at the start of the 1980s, just how important personal computers were going to be by the end of the decade.

Second, as a result of this, the company entrusted the development of the original IBM Personal Computer (introduced in 1981) to what was—for IBM at least—a highly independent business unit in Boca Raton, Florida. There, relatively unencumbered by the bureaucracy normally surrounding future product planning at IBM, the IBM PC, XT, and AT were born.

The third aspect of the problem is that IBM's Don Estridge and his developers in Boca Raton emulated much of the best work being done by independent entrepreneurs at the time and thus built the most open system ever to receive an IBM label.

Its freely available specifications made it easy for other vendors to develop software, add-in boards, and peripherals for it—and it also made it easy for others to build entire systems that would be compatible with it.

FAILURE UNDER FIRE The result, by 1986, was that hundreds of vendors all over the world were selling PCs that were effectively compatible with IBM's PC, XT, and AT systems, and IBM's market share was declining. IBM was losing out to compatible competitors. That would have been bad enough even if personal computers had remained the "toy" market IBM management seemed originally to have thought them to be. The situation was much worse given that PCs were becoming a fundamental part of corporate information systems.

In retrospect, it's hardly surprising that IBM suffered losses when faced with di-

rect competition. IBM was accustomed to the very limited competition among traditional, proprietary-architecture-based mainframe and minicomputer systems of the past, not to the open competition among increasingly standardized, commodity-like microprocessor-based systems of the future.

IBM was never really aggressive on pricing. You don't need to be when you have dominant market share in a market that has very limited competition and therefore permits you to engage in almost monopolistic pricing practices.

IBM was never really aggressive when it came to innovation, either. You don't need to be when, because of the lock-in between the software and the training investment of your customers, they really have no place else to go.

So when IBM was faced with hordes of competitors offering personal computers that were much more aggressively priced or much more innovative than IBM's, Big Blue had a very difficult time responding adequately. The company just wasn't used to real competition.

Consider the almost-forgotten humiliation IBM suffered when it tried to regain territory lost to Compaq's innovative (for its time) transportable system. Except for the hapless members of the entering class at the Harvard Business School who were ordered to buy them, hardly anyone bought IBM's luggable units. Quite simply, they weren't as good as the competitive product.

By mid-decade it was becoming evident that if IBM had to compete on a level play-



■ WILLIAM F. ZACHMANN

ing field with everybody else, it was probably going to lose. Even though some of the compatible vendors didn't make it, others quickly moved in to take their place. IBM's total market share was sinking. Its

workstation-category revenues, of which personal computers are the major part, actually declined more than a billion dollars between 1985 and 1986 and have yet to recover more than a fraction of that loss.

THE SECRET WEAPON Unable to compete effectively, IBM chose to fight back in another manner. It set out to eliminate competition. The IBM Micro Channel architecture was to have been the major weapon. Incompatible with the AT standard and protected by a bevy of "intellectual property rights" in the form of patents (and an army of lawyers to enforce them), the MCA was supposed to be the weapon to slay competitors—or at least beat them into submission.

IBM's Micro Channel architecture was meant to become the new industry standard—but a "standard" that was proprietary to IBM. From the start, IBM intended to use its patents as a way to prevent other vendors from building MCA-compatible systems, or at least to control their ability to do so, protecting its own pricing or market share by making the others pay substantial royalties.

The problem was that IBM neglected to build into the MCA anything that anybody really needed. The MCA offered no significant functional capabilities or performance advantages over the AT design: MCA bus systems performed no better than AT bus systems with comparable clock speeds and disk drives. At best, IBM could weakly claim potential advantages due to the MCA's 32-bit data path or its multimaster capabilities.

With the introduction of the Extended Industry Standard Architecture last fall, however, IBM's competitors were able to promise all the still-hypothetical advantages of the MCA and more. The EISA specification not only has the same technical advantages, but it also offers strict upward compatibility with existing AT-bus-standard cards.

As EISA starts to deliver on that promise in 1989, the ultimate battle between IBM and its competitors will be waged. Given how badly things have gone for IBM thus far, it is hard to see how EISA can fail to make things even worse for the company. For users, however, EISA promises to be a real standard that will enhance competition and accelerate innovation. Perhaps it will also finally convince IBM management that it is more worthwhile to compete effectively than to eliminate competition. Everyone—even IBM—would benefit in the end. □



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Stuffing a disk with megabytes of useful and fascinating information is easy. Finding the information that's useful and fascinating to you is the hard part.

With the help of CD-ROM, giant hard disks, and other storage technologies, you can now put gigabyte upon glorious gigabyte of information at your fingertips. The catch: How do you winnow the wheathy information you really need from the enormous pile of data chaff? There are so many different answers that an unheralded guerrilla war is erupting for dominance in search and retrieval software. So far there's nothing that even remotely resembles a standard; no individual product seems to hold even as much as 10 percent of this fragmented market. In part that's because the software remains in the dark ages.

OLD AS THE WORD The problem of text retrieval is as old as the written word. Over the ages, scholars and librarians have developed and refined elaborate indexing, abstracting, cross-referencing, and cataloging systems. But the computer permitted—and demanded—utterly new and vastly more powerful methods of finding relevant information.

These techniques showed up first in online databases—from which most of today's retrieval tools are all too obviously descended. Most of the early model retrieval software was so dreadful it spawned a cadre of trained specialists; inexperienced users' stumbling over question-mark-prompt interfaces could run up charges resembling the gross national product of third-world countries. With the advent of the personal computer, the software got marginally better—in many cases, via the expedient of a PC-resident shell that helped bring order to

the chaos of the multifold ugly faces presented by distant mainframes.

The techniques of retrieval soon migrated to PCs in such products as *ZyIndex* and *GOfer*, which allow you to search through your own files via Boolean AND, NOT, and OR means as well as such non-Boolean terms as NEAR. *GOfer* uses brute force to search in much the same way as a word processor; *ZyIndex*, on the other hand, must create and store information about each file in an "inverted index" before it can search. The problems with indexing are its demands on disk space and the user's memory; forgetting to index a file renders it nonexistent for search purposes. But once an index is ready, it speeds up searching enormously. Whether indexing is a good idea for changeable data can be a tough call.

But CD-ROMs are so inherently slow that any retrieval software worth its salt must make use of indexes—extensively.



In fact, the indexes themselves—what they contain, how they're structured, and how they relate to the physical layout of the disk and the text stored on it—are crucial to retrieval performance. For example, indexes can be carefully structured to avoid making the long head seeks that are the bane of CD-ROM access times.

Current CD-ROM software, alas, tends instead to rely on quick-and-dirty ways of improving performance. If, for example, you're creating a single disk with the contents of 40 separate books, you can set up 30 or 40 separate indexes and allow users to search only one at a time—reasonable enough if the separate databases contain wildly disparate information. But Microsoft's *Programmer's Bookshelf* uses a variant of this technique to the detriment of the product. Want to search the whole disk for every reference to interrupt 17? No can do: it's up to you to search through nine separate sections.

But that's a minor problem. The key question with any big collection of data is *how* the user gets relevant information. Speed isn't simply a mechanical function of the retrieval engine; it's a question of the user interface as well.

Let's say, for example, you're looking for articles about using CD-ROM in the real estate business. You perform a typical search on CD-ROM AND REAL ESTATE. The software finds 50 "hits"—articles that match your search.

At this point the software might show you an abstract or title for each article it's found. It might even let you search through each article and find the words you

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searched on. But the catch—critical when hundreds of “hits” are on the list—is that it probably won’t arrange the material in any useful order. You could search more narrowly—by taking the current search

and restricting it with, say, SEARCH 1 AND PROPERTY VALUES—but that runs the risk of eliminating articles you really might want to look at. So you’re forced to look through virtually every arti-

cle if you want to be thorough.

But what if the software made some guesses—based on, say, the number of appearances of your search words in each article relative to its length? The program could then present you with the articles it suspects are most relevant at the top of the list and the least relevant items—likely “false hits”—at the bottom.

And studies show that even trained searchers miss lots of relevant articles. What if the computer could actually analyze the articles you have found to help find the ones you overlooked—for example, by noticing that certain words appear with significantly more than random frequency in the articles you’ve found and then generating a search based on that information?

Algorithms to do this have been around for a long time; implementations are scarce, in part because experts differ on their effectiveness, in part because such analysis can be extremely slow. But here again, indexing techniques might come to the rescue. If the index contained most of the content analysis already, response could be speeded significantly.

Indexing optimization aside, there are other ways of improving performance. One is to buffer intermediate results in a big chunk of RAM, on the theory that you may want to “go back” and check out something you’ve already seen. So far most CD-ROM software doesn’t work that way; just moving the cursor through a list of topics in programs such as *Microsoft Bookshelf* often causes annoying waits.

Another technique (ripe for OS/2) is the idea of background queuing of information as you work in the foreground. The idea is to keep pouring likely information into RAM even while you’re just reading the screen, deciding what to do next. If, for example, your search came up with 50 items, the full text from those items would begin to be yanked from disk into RAM even before you asked for them in a sort of “prefetch cache” arrangement.

Then there’s hypertext—but fortunately I’m out of space. No matter: the development of text retrieval is still in its infancy, with plenty of time to add heft and sinew as it grows up. If you want a *real* challenge, think about how we’re going to retrieve graphics and sound. □

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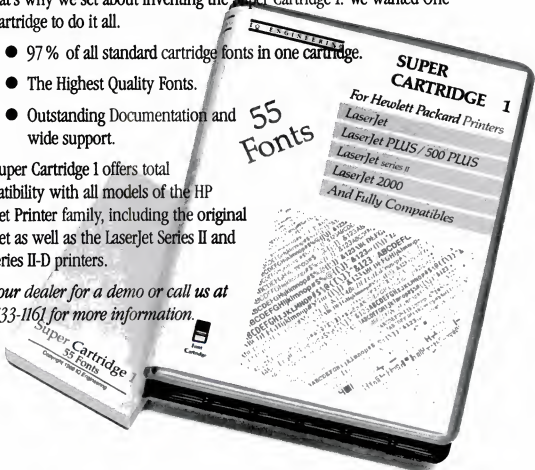
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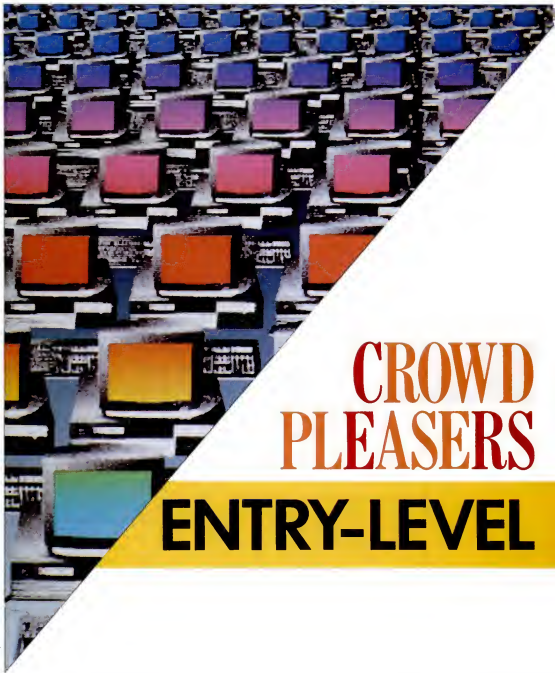
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CROWD PLEASERS

ENTRY-LEVEL

W

hen it comes to processing power and performance, nothing beats today's 80386-powered desktop PCs. But 386 power isn't at the top of the charts when it comes to sales volume, and for good reason. The largest bulk of new computers goes not to power demons but to midrange users whose needs are easily met by the rock-steady performance of an 80286-powered PC.

Most 286s are slower and less powerful than their 386 brethren. The vast majority run at clock speeds of 10 to 12 MHz. Some newer ones use 80286 chips, made by Harris Semiconductor or Advanced Micro Devices (AMD), that are capable of speeds of up to 20 MHz. But just when 286s caught up with 386s in the 20-MHz zone, 386s emerged running at speeds of up to 25 MHz and are expected to reach 33 MHz within the next year.

Despite speed issues, the most compelling motivation for buying a 286-based PC still exists: 286s cost a great deal less than equivalent 386-based models. That cost difference comes from two sources: the higher price of 80386 processors and the higher cost of the more complex support system required in building 386-powered comput-

Powerful enough for most applications, 286 computers haven't been knocked into oblivion by their faster 386 competitors. Low price is still the biggest reason for the survival of the bread-and-butter 286.

12-MHz 286s

■ 12-MHZ ATs

ers. Intel's new 80386SX processor is designed to close that gap in the future. The new chip costs less than a standard 80386 primarily because its 16-bit design lowers the cost of its required support systems. The combination should someday put 386SX processing power into the hands of most midrange PC users. But the 386SX was introduced only last August and isn't yet widely available to PC vendors, so that day may not arrive for quite a while.

Some people even wonder if it *should* happen. A 286-powered PC can run anything DOS can handle, although that means it's stuck with those DOS limitations we've all come to hate. And it will run OS/2 programs—with or without the Presentation Manager—just fine. About the only things a 286-based PC can't do is run programs specifically designed for the 80386, such as *Windows/386*, *VM/386*, *PC-MOS*, and extended DOS programs including *Paradox/386*. If that doesn't mean anything to you, then 286 power is probably just fine for what you do.

In any case, 286-powered computers remain an important—perhaps the most important—force in today's PC marketplace. They currently represent about 45 percent of all PCs purchased, and most forecasts show that number remaining steady over the next few years, while 386-based PCs grow at the expense of the market share once held by 8088 and 8086-based PCs. In fact, if you're worried about buying 286-powered PCs at a time when 386 and 386SX power is about to become the right choice for midrange users, don't be. What those numbers indicate is that 286-powered PCs will fill the entry-level role of today's 8088 and 8086-powered PCs quite nicely.

ROOTS The first popular 80286-powered PC was the original AT introduced by IBM in 1984. When combined with an Enhanced Graphics Adapter and matching display, the AT defined the power user's machine of choice. With a clock speed of 6 MHz, an I/O and memory bus capable of moving data to and from the processor 16 bits at a time, and a 20MB hard disk with 40-millisecond access times, the AT outperformed the 8088-powered XT by about six to one. Like every new generation of PCs, the AT quickly

THE EVOLUTION OF THE PC MICROPROCESSOR

Before investing in an 80286-based computer, be certain that your applications can live without the benefits of 80386 processing.

One of the first microprocessors was created not as the brain of a computer but as a clever solution to a business problem. In 1969 a now-defunct Japanese calculator company, *Busicom*, requested a still-very-funct Intel Corp. to create perhaps 12 integrated circuits for a line of electronic calculators. To avoid the cost of developing a dozen new chips, Intel's Ted Hoff hit upon the idea of using one general-purpose device that could serve as the foundation of all the calculators. That general-purpose circuit became the **4004**, the first successful commercial microprocessor. All personal computers are based on microprocessors that owe their heritage to the 4004.

ENTER INTEL The first important personal computer microprocessor was Intel's 8080, introduced in 1974. While the 4004 had registers (internal memory areas in which its calculations are performed) capable of storing 4 bits at a time, the 8080 had 8-bit registers, an effective doubling of power. In addition, the 8080 had 16 address lines, letting it directly access 64K of memory—at the time, a prodigious amount. The CP/M

operating system, the first business standard and the predecessor of PC-DOS, was designed to operate on the 8080 or the more efficient 280 chip developed by Zilog Corp. (itself founded by former Intel employees).

In 1978 Intel introduced the **8086**, which again doubled the register size (to 16 bits) and also added four new address lines, thus increasing its direct memory-handling abilities to 1MB. Other improvements gave the 8086 about ten times the power of the 8080.

Intel strove to make the 8086 as compatible as possible with the 8080 by incorporating all the latter's commands into the instruction set of the former. Moreover, the 8086's addressing range was divided into 16 segments of 64K apiece, each of which acted like the memory area of the 8080 to make the transition to the new chip easier for programmers.

A year after the introduction of the 8086, Intel added the **8088** to its product mix. The new chip was identical to the 8086 except that it used an 8-bit data bus rather than the 16-bit data bus used by the 8086. The narrower bus of the 8088 meant that it could use less-expensive support chips without sacrificing 16-bit power or 20-bit addressing. The possible



4004



8086

savings proved so alluring that the 8088 was selected by IBM as the brains of its first generation of PCs, including the PC itself and the XT, PCjr, and Portable Personal Computer.

UP TO FIVE DIGITS In 1982 Intel introduced the 80286. Although the new chip used a 16-bit data bus with 16-bit internal registers like the 8086, it ran more efficiently. It could calculate four to five times faster than an 8086 running at the same clock speed. But the 80286's biggest improvement was its superior memory-handling ability. Instead of the 20 address lines of the 8086/8088, the 80286 had 24. The four extra lines increased the maximum amount of memory the chip was able to address by 15MB, for a total of 16MB.

Like the 8086, the 80286 was designed to maintain backward compatibility with its predecessors—in this case, by using two operating modes. In real mode, the 80286 mimicked the 8086 and allowed the direct addressing of 1MB of RAM in 16 64K segments. In protected mode, the full 16MB addressing range of the 80286 was available to programs.

The 80286 also allowed the use of virtual memory. That is, it could shuffle information from RAM to disk memory to simulate greater reserves of solid-state memory, up a total of 1 gigabyte (1,024MB). However, the 80286 required special support chips to handle the actual swapping of bytes.

Because the 80286 was released before the success of DOS was proven, one aspect of its design turned out to be short-

sighted. Its huge protected-mode memory was essentially off-limits to DOS programs; software had to be specially written to use protected mode.

386SX AT LAST The 80386, introduced in 1985, doubled the size of the 80286's registers and data bus, and stretched its address bus to the same 32 bits. Information potentially could be moved into the chip and processed twice as fast as with 16-bit chips, and up to 4 gigabytes of solid-state RAM could be directly addressed. In addition, the 80386 could handle up to 16 terabytes (that's a trillion bytes) of virtual memory. The chip had full facilities for managing all this memory built into its circuitry.

The 80386 was designed to be backwardly compatible with previous Intel microprocessors. To that end, it had a real mode, complete with a 1MB addressing limit and segmented memory. The chip booted up in this mode and operated in it, for all intents and programs, as if it were a fast 8086.

From real mode, the chip could be switched into protected mode. Here it functioned like an 80286 except it had more memory and flexibility at its disposal. The protected-mode memory could be used as a single contiguous block or as segments of almost any size.

To these modes, the 80386 added a new one that reflected the importance DOS had achieved as the chip was being developed. Its new virtual-8086 mode allowed the 80386 to simulate not just one 8086 but an almost unlimited number of them, all at the same time. In virtual-

8086 mode, a single 80386 microprocessor could divide its memory into many virtual machines, each one acting like an entirely separate computer equipped with an 8086 microprocessor running its own DOS program.

The 80386 also added performance-enhancing improvements such as 16 bytes of prefetch cache memory to store the next few instructions of the program the chip would be executing. This small cache helped the 80386 run more smoothly, with less waiting as code was retrieved from system memory.

In 1988 Intel created the ultimate compromise, the 80386SX, a scaled-down 80386 that loses power but not features. Just as the 8088 was derived from the 8086 to facilitate the use of cheaper 8-bit components, Intel created the 80386SX as a little sister to the 80386. Internally, the 80386SX is nearly identical to the 80386 with full 32-bit registers and all the same operating modes, just as the 8088 is a 16-bit chip like the 8086 inside its epoxy case.

Only two major differences separate the 80386 from the SX. Instead of interfacing to a 32-bit memory bus, the 80386SX is designed for less-expensive 16-bit components and a 16-bit bus. Its 32-bit registers must be filled in two steps from a 16-bit I/O channel. And the 80386SX is cheaper by about \$100, making it a bargain of sorts for those who prefer a more leisurely computing pace.

—Winn L. Rosch

Winn L. Rosch is a contributing editor of PC Magazine.



8086



80286



80386

■ 12-MHz ATs

became a best-selling machine.

However, the early ATs were plagued by hard disk failures. Without any warning, a user's disk would fail, usually taking all 20MB of data with it (for a full report on AT hard disks, see "Courting Disaster: The IBM PC AT," *PC Magazine*, April 29, 1986). Not much would have happened if there were only a few cases, but the problem was widespread among hapless early AT owners, and that opened the window to AT-clone makers that pounced on IBM's vulnerable product with more reliable ones.

IBM further weakened its AT product by continuing to run the 80286 processor at

tion offered better pricing and often included displays, display adapters, and software in attractively priced packages.

The PC AT continued to sell well, but IBM's market share had eroded seriously and continued to dwindle. In a bold move in 1987, IBM introduced its PS/2 line of PCs characterized by the all-new proprietary input-output bus that IBM termed Micro Channel architecture. The PS/2 lineup included the 80286-powered desktop Model 50 and the floor-standing Model 60. Both systems sported sluggish 10-MHz clock speeds and were further hampered by slow memory chips that required the insertion of a wait state in memory-fetch cycles. The original PS/2 Model 50 was also plagued by an XT-class 80-millisecond hard disk that just won't do for serious midrange users.

The Model 50 sold reasonably well, but more because of its minuscule footprint than anything else. The competition quickly caught on to that strategy and started producing 286-powered PCs that made economical use of desktop real estate. Many vendors had in fact already been producing real estate-efficient 286s when IBM "legitimized" the tiny configurations and boosted their popularity.

Not true for floor-standing 286-powered PCs. There are a few, but the Model 60 stands tall though small in a marketplace that doesn't think floor space should be given up to anything less than a hotshot 386-based file server.

More recently IBM introduced the Model 30 286, which the company has positioned as an entry-level 286. It employs a standard 16-bit AT-style bus rather than the company's Micro Channel architecture, a move that many industry pundits say means IBM is giving up on the Micro Channel. IBM claims the move was made to keep the 30 286's price low, and its sluggish 10-MHz, one-wait-state performance substantiates that claim.

But the new machine does fuel the idea that 286s are meant for entry-level PC users while 386-based PCs take over the middle range and next-generation 80486-based PCs become the top of the line.

THIS ISSUE'S CROP This roundup includes a baker's dozen of recent 286s with clock speeds of 12 MHz. By now 12-

MHz, 286-based PCs come in all shapes and sizes, and those included here prove the point. Nearly half, for example, are small-footprint machines, while the rest reside in standard-sized cabinets.

Perhaps more interesting is that newer 286-based PCs have more system components integrated onto the motherboard than older designs. Some have just the serial and parallel ports integrated, while others include a video display controller or the disk controller on the system board. Older designs use expansion slots for those components, leaving fewer slots for you to use for adding options to your PCs.

As for performance, you may find that these machines are disappointingly similar. The greatest disparities are among video times, and if fast video is your priority, you may find that a computer like the Northgate 286/12 is your obvious choice. Otherwise, brand name, expandability, and parts quality will distinguish the stellar from the earthbound.

Certainly these 13 computers aren't your only options, nor are they the least expensive. For 21 price slashers under \$2,000, check out "The Cheapest ATs Ever," *PC Magazine*, February 16, 1988.—John Dickinson

John Dickinson is director of PC Labs.

ADVANCED LOGIC RESEARCH INC.

ALR Dart 12.5 Model 30

You gotta love a computer that stands up for you, even if it's only an "entry-level" machine. The ALR Dart 12.5 Model 30 can work just as well sitting horizontally on a desktop, but the company logo is embossed on the case sideways so that it looks right only when the computer is standing on end. Computers that stand on end must be powerful, right? Adding to the Dart's impression of power is a drive cover that hides the front of the lowly floppy drive.

The Dart 12.5 is an 8- and 12.5-MHz-clock-speed, one-wait-state system with a Phoenix Technologies ROM BIOS and AMD (Advanced Micro Devices) processor chip. The interface bus runs at a constant 8 MHz for software and hardware compatibility. Setup is on diskette rather than in ROM, so whenever you change

**IBM weakened
its AT by running
the processor at
a sluggish 6 MHz,
while the competi-
tion ran clones
at 8 MHz and faster.**

a sluggish 6 MHz, while the competition was running AT clones at 8 MHz, 10 MHz, and even faster. And besides offering more-reliable hard disks, the competition offered larger and faster ones. IBM finally relented in 1986, when it raised the 80286 clock speed to 8 MHz and began using hardier, IBM-manufactured 30MB hard disks. The AT 339 became the most popular IBM-made PC ever, as well as one of the most reliable.

But by then the competition had a firm beachhead on IBM's AT turf and proceeded to run amok. Competitive clock speeds went up to 12 MHz, and hard disks went over 40MB, all the way up to 100MB. More memory became standard, and options, such as built-in serial and parallel ports, were added to system boards. It almost goes without saying that the competi-

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■ 12-MHZ ATs



The bare-bones ALR Dart 12.5 Model 30 sells for \$1,795 with 512K RAM. The tested configuration came with two serial and two parallel ports, both 25-pin; the ALR is the only machine in this roundup with the extra port. This computer has a stand (not shown) to transform it from a desktop unit to a floor-standing model, depending on your preference.

your machine configuration (most likely a rare occurrence), you have to load the program from the floppy disk.

While the basic Dart comes with 512K of 80-nanosecond memory, an additional 1.5MB of memory fits right on the motherboard. If you want to bring the system memory up to 2MB, this machine has several advantages. The memory chips plug into four rows of 18 chip sockets each, each row (techies, read "bank") holding 512K. Unlike some other machines that require you to replace your original 256-kilobit chips with 1-megabit chips to get up to full motherboard memory, the Dart just lets you keep adding the same kind of chips. You aren't left with homeless 256-kilobit chips. (Even though memory chips were scarce last year, how many people know of a convenient place to cash in extras?)

You also don't have to bear the expense

of buying a memory expansion board to get to 2MB. If you need more than 2MB, you're probably running OS/2, and you're probably used to paying so much money to get ready for that privilege, that buying an extra board will cause only a minor ripple in your budget spreadsheet. With expansion cards, the Dart supports up to 16MB of RAM.

The last memory benefit in this computer's expansion scheme is that all memory plugged into the motherboard hums right along at full system speed, in this case 12.5 MHz. Otherwise you can load up a memory expansion card with expensive fast chips, but you'll still have to live with the expansion bus slowing down to the relatively sedate speed of 8 MHz.

The Dart uses memory in a conventional manner; there are no performance-enhancing tricks like memory interleaving or shadow RAM.

The Dart 12.5 Model 30 as tested came with 512K RAM, a 30MB hard disk, a 1.2MB floppy disk drive, a Hercules-compatible monochrome adapter, a high-resolution amber monochrome display, two serial and two parallel ports, and a combination floppy-and-RLL-hard-drive controller. With DOS this system costs \$2,045. You can buy it without the hard drive, video card, display and I/O ports, and with no DOS for \$1,795, but the components you pick up for the extra \$250 make that a no-brain decision, even if you intend to replace some of these components immediately.

One of the reasons the fully configured system is so inexpensive may be that RLL hard-drive controllers get 1½ times more storage capacity from hard disks than standard controllers do. Since you get an RLL controller with the basic box anyway, ALR can sell a pedestrian 20MB drive that the controller makes into a 30MB unit.

The tested model also included a second serial port—a \$50 option. One point to note is that both serial ports use 25-pin connectors (the older standard), not the newer 9-pin style. ALR does not sell this machine configured with either EGA or VGA display boards and monitors.

The whole point of the Dart is that it allows ALR, a company that often makes the news with screaming 386 monsters, to offer a relatively low-cost computer.



FACT FILE

ALR Dart 12.5 Model 30
Advanced Logic Research Inc.
9401 Geronimo
Irvine, CA 92718
(800) 444-4ALR
(714) 581-6770

List Price: With 512K RAM, 1.2MB 5¼-inch floppy disk drive, DOS 3.3, \$1,795; with 1MB RAM, 30MB hard disk, monochrome card and monitor, \$1,995. Extra serial port, \$50.

In Short: The ALR Dart 12.5 Model 30 is a good buy in a big box from a vendor whose name in the last 2 years has become synonymous with speed. The motherboard is a proven product that has been used on much faster machines. This entry-level machine is a solid value with name-brand components.

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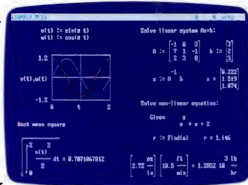
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12-MHz 286-based PCs: Summary of Features

(Products listed in ascending base-price order)

The following commentary analyzes some of the terms in this table of features. The phrases in bold type are listed in the same order as in the left-hand column of the table.

Basic configuration Because hardware vendors frequently offer a choice among various hard disk drives and monitors—at different prices—we are reporting the price of a completely stripped-down model as a "basic" configuration. Note that these prices are not always strictly comparable because some vendors will not sell their computers without hard disk or monitor. Therefore, when comparing products, please consult the "standard configuration" prices as well.

Floppy disk drives In each instance, a 3½-inch floppy disk drive is available as an option, though there may be an extra charge.

Software included Hardware manufacturers may or may not bundle software with their computers. Bundled software may include DOS, disk caching programs, setup and install programs, and various utilities. DOS is often available only at an additional cost.

Reset switch Many computers now come with a reset switch allowing a cold reboot of the computer.

Clock/calendar An internal, battery-operated clock/calendar makes it unnecessary to reset the computer's time and date each time the computer is turned on.

Standard configuration Purchasers will normally want a more elaborate system than our "basic" configuration. For the sake of price comparisons, our "standard" configuration includes 1MB RAM, a hard disk of at least 30MB, one floppy disk drive, a monochrome display, at least one parallel and one serial port, DOS, and a keyboard. The price of each system is listed by the size of its hard disk. No price appears for the IndTech 286 5192 Power Series because the company does not provide a hard disk drive or monitor.

Tested configuration The specifications (and list prices) of the evaluation units depend on what configuration each manufacturer has decided to send us for testing.

Upgrades and additions to the basic configuration summarizes the distinctive features of the models that were actually reviewed.

Bus clock speeds (MHz) Bus speed becomes more important as computers run at faster clock speeds. A computer's bus speed may actually be too fast for expansion cards, most of which operate at 8 or 10 MHz. Time-out periods, sometimes called wait states, are often used to slow down the bus.

Disk controller manufacturer and type Disk encoding techniques currently include RLL (Run Length Limited) and the older MFM (Modified Frequency Modulation) scheme. All data is encoded onto and read from your hard disk as a series of polarity-reversing bits representing ones and zeros. Nine such bits would be needed to store 12 bits of data in MFM format, and only six polarity changes are required with RLL format; thus, MFM takes more space than RLL but provides a more stable environment and is more commonly used.

BIOS version and date The BIOS date is important to those planning to use 3½-inch disk drives. Early BIOS versions cannot handle this format.

Memory chip type In this context, Kb and Mb refer to kilobits and megabits, respectively.

Chip packaging Memory chips come in a variety of styles. The Dual In-line Package (DIP) is the traditional bulge computer chip sporting 8, 14, 24, or even 40 or more metal legs (evenly divided between right and left sides). Single In-line Memory Modules (SIMMs) are individual logic devices that are installed on their own small circuit board, creating a component module that can be plugged into a larger device.

RAM chips RAM chips come in two basic types: static and dynamic. Dynamic RAM chips (DRAMs) cost less and are more common, but the trade-off is in slower processing.

Interleaved memory CPU speed is usually faster than memory speed. Interleaved memory increases processing speed by splitting the memory into two or more portions. The CPU then sends information to a section at a time, allowing one section to process while another receives data.

Shadow RAM Shadow RAM is a technology that loads system BIOS or video BIOS directly into last RAM on boot-up of the computer. The BIOS then operates much faster.

Disk cache software Some companies provide software to facilitate caching. Other computers can generally take advantage of the caching facility within some version of DOS.

FCC certification class Two classes of FCC (Federal Communications Commission) approval may be given to computers: Class A and Class B. These classes concern levels of radio-frequency interference. With Class A approval, a computer may be operated in a business locale. The tougher Class B rating allows home use as well, where computers are likely to be placed near radios and television sets.

BASIC CONFIGURATION		Zees 286/12	Amx PC/286	Micro Lab 286/12	Dell System 280
List price		\$995	\$1,095	\$1,197	\$1,549
RAM		512K	512K	512K	640K
Floppy disk drive(s)		One 1.2MB 5¼-inch or one 720K 3½-inch	One 1.2MB 5¼-inch or one 720K 3½-inch	One 1.2MB 5¼-inch	One 1.2MB 5¼-inch or one 1.44MB 3½-inch
Hard disk drive		None	None	None	None
Drive bays		Three half-height	Five half-height	Five half-height	Five half-height
Software included		Setup, diagnostics, EMS drivers	Setup	Diagnostics, Disk Manager	Dell System Analyzer
DOS/2 available		○	○	○	Optional (\$325)
Monitor		None	None	None	None
Ports		One serial, one parallel	One serial, one parallel	One serial, one parallel	Two serial, one parallel
Slots		Two 8-bit, six 16-bit	Two 8-bit, six 16-bit	Two 8-bit, six 16-bit	Two 8-bit, four 16-bit
Power supply (watts)		200	200	200	200
Reset switch		●	●	●	○
Clock/calendar		●	●	●	●
Keyboard connector		Back	Back	Back	Back
Keyboard cable length (inches)		72	72	72	72
STANDARD CONFIGURATION					
Price of monochrome system with 1MB RAM, hard disk, and DOS		\$1,972 (49MB)	\$2,195 (40MB)	\$2,167 (40MB)	\$3,169 (40MB)
Price of VGA system		\$2,667 (49MB)	\$2,509 (40MB)	\$2,907 (40MB)	\$3,569 (40MB)
TESTED CONFIGURATION					
List price		\$2,467	\$2,450	\$2,242	\$3,019
Upgrades and additions to the basic configuration		1MB RAM, 49MB hard disk, EGA card and monitor, DOS 3.3	1MB RAM, 40MB hard disk, 1.44MB 3½-inch floppy disk drive, VGA card and EGA monitor, DOS 3.3, GW-BASIC	1MB RAM, 40MB hard disk, DOS 3.3	40MB hard disk, VGA card and monitor, DOS 3.3
Microprocessor clock speeds		8/12.5 MHz	6/12 MHz	6/12.5 MHz	6.25/6.33/12.5 MHz
Wait states		0	0	0	1
Bus clock speeds		8 MHz	6 MHz	8 MHz	6.25/6.33 MHz
Disk controller manufacturer and type		Adaptec (RLL)	Western Digital (MFM)	Western Digital (MFM)	Western Digital (MFM)
System drive capacity		Controller card handles two floppy and two hard disk drives	Controller card handles two floppy and two hard disk drives	Controller card handles two floppy and two hard disk drives	Controller card handles two floppy and two hard disk drives
BIOS version and date		Award BIOS, Version 3.03	Phoenix BIOS, Version 3.07, (January 1986)	Phoenix BIOS, Version 3.10 (1986)	Phoenix BIOS, Version 3.10 (1986)
System board manufacturer		Sontac	Amx	Mico Lab	Dell
286 chip set manufacturer		Intel	Intel	Intel	Intel
MEMORY SPECIFICATIONS					
Memory chip type		256Kb	256Kb	256Kb	256Kb
Chip packaging		DIP	DIP	DIP	SIMM
RAM chips		DRAM	DRAM	DRAM	DRAM
Interleaved memory		○	○	○	○
Shadow RAM		○	○	○	○
Type of cache controller		N/A	N/A	N/A	N/A
Disk cache software		○	○	○	○
Maximum RAM on motherboard		4MB	1MB	1MB	4.5MB
Maximum total system RAM		16MB	16MB	16MB	16MB
OTHER					
Warranty		1 year parts and labor	1 year parts, 90 days labor	1 year parts and labor	1 year on-site service
FCC certification class		A	B	B	B

●—Editor's Choice ○—No

N/A—Not applicable: the product does not have this feature or is not available in this configuration.

IntelTech 286 5192 Power Series	ALR Dert 12.5 Model 30	Austin 286/12.5	Epson Equality II Plus	Northgate 286/12	ARC ProTurbo 286	NEC PowerMate I Plus	Zenith 2-248/12 Model 80	Kaypro 286/1 Model C
\$1,738 \$12K One 12MB 5 1/4-inch	\$1,795 \$12K One 12MB 5 1/4-inch	\$1,895 1MB One 12MB 5 1/4-inch	\$1,899 640K One 12MB 5 1/4-inch	\$1,995 1MB One 12MB 5 1/4-inch or one 144MB 5 1/4-inch	\$2,045 640K One 12MB 5 1/4-inch or one 144MB 5 1/4-inch	\$2,595 640K One 12MB 5 1/4-inch or one 144MB 5 1/4-inch	\$2,999 1MB One 12MB 5 1/4-inch or one 144MB 5 1/4-inch	\$3,095 1MB One 12MB 5 1/4-inch
None	None	20MB	None	67MB	None	None	None	40MB
Five half-height	Five half-height	Four half-height	Three half-height	Five half-height	Three half-height	Three half-height	Six half-height	Six half-height
Setup	Setup, DOS 3.3, GW-BASIC	Diagnosics, utilities, DOS 3.3	Setup, diagnostics, DOS 3.3, GW-BASIC	DOS 3.3, GW-BASIC, VQbit, Insta-Cache	Utilities, video driver, DOS 3.3, GW-BASIC	Setup, DOS 3.3, GW-BASIC	Utilities, DOS 3.3, Microsoft Windows/ 286	Video driver, DOS 3.3, GW-BASIC, Microsoft Works
()	()	()	()	()	()	Optional	Optional (\$300)	()
None	None	Monochrome	None	Monochrome	None	None	None	None
None	None	Two serial, one parallel	One serial, one parallel	Two serial, two parallel	Two serial, one parallel	One serial, one parallel	Two serial, one parallel	One serial, one parallel
Two 8-bit, four half-length 8-bit, six 16-bit	Two 8-bit, two 16-bit	One 8-bit, three 16-bit	Three 8-bit, three 16-bit	Two 8-bit, six 16-bit	One 8-bit, four 16-bit	One 8-bit, six 16-bit	Two 8-bit, two 16-bit	Three 8-bit, two 16-bit
238	200	180	140	250	150	165	200	217
●	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●
Back	Back	Back	Front	Back	Front	Back	Back	Back
72	72	72	48	72	48	120	96	72
N/A	\$1,995 (30MB)	\$1,995 (40MB)	\$3,268 (40MB)	\$1,995 (67MB)	\$3,005 (50MB)	N/A	N/A	\$3,339 (40MB)
N/A	N/A	N/A	N/A	\$2,599 (67MB)	N/A	\$4,040 (42MB)	\$5,495 (40MB)	N/A
\$1,738 None sold by IntelTech	\$2,045 30MB hard disk, monochrome card and monitor, two serial and two parallel ports	\$2,395 40MB hard disk, EGA monitor	\$3,697 40MB hard disk, EGA card and monitor	\$2,599 VGA card and moni- tor, two serial and one parallel port	\$3,260 50MB hard disk, EGA monitor	\$3,995 42MB hard disk, EGA card and monitor	\$6,498 72MB hard disk, VGA card and monitor	\$3,919 EGA card and monitor
6/12 MHz 0 8 MHz	6/12.5 MHz 1 8 MHz	8/25/12.5 MHz 1 8.25 MHz	6/12 MHz 1 8 MHz	6/12 MHz 0, 1 8/12 MHz	6/12 MHz 0, 1 8 MHz	6/12 MHz 0 8 MHz	6/12 MHz 0 6.6/10/12 MHz	6/12 MHz 0, 1 8 MHz
Western Digital (MFM)	Adaptec (RLL)	Western Digital (MFM)	Epson (MFM)	Adaptec (RLL)	Western Digital (MFM)	Western Digital (MFM)	Zenith (MFM)	TDC or NCL (MFM)
Controller card handles two floppy and two hard disk drives	Controller card handles two floppy and two hard disk drives	System board handles two floppy and one hard disk drives	System board handles two floppy and one hard disk drive	Controller card handles two floppy and one hard disk drives	System board handles two floppy and one hard disk drive	Controller card handles two floppy and one hard disk drive	Controller card handles two floppy and two hard disk drives	Controller card handles two floppy and two hard disk drives
IntelTech BIOS, Version 14.02, (1988)	Phoenix BIOS, Version 3.10 (1988)	Phoenix BIOS, Version 3.10 (September 1988)	Epson BIOS, Version 2.02 (January 1988)	Award BIOS, Version 3.03	AMI BIOS, Version 4.10 (November 1987)	Phoenix BIOS, Version 3.11 (1988)	Zenith BIOS	Phoenix BIOS, Version 3.10 (1988)
IntelTech	ALR	Western Digital	Epson	Northgate	ARC	NEC	Zenith	Kaypro
Intel	AMD	Intel	Intel	AMD	Zymos	Intel	Info not available	AMD or Intel
256Kb DIP	256Kb DIP	256Kb SIMM	256Kb DIP	256Kb DIP	256Kb DIP	256Kb DIP	1Mb SIMM	256Kb SIMM
DRAM	DRAM	DRAM	DRAM	DRAM	DRAM	DRAM	DRAM	DRAM
●	○	○	○	●	○	○	○	●
○	○	●	○	○	○	○	●	●
N/A	N/A	Western Digital	N/A	N/A	N/A	Western Digital	N/A	N/A
○	○	○	○	●	○	○	○	○
1MB	2MB	4MB	640K	1MB	1MB	640K	6MB	8MB
16MB	16MB	16MB	16MB	16MB	16MB	16MB	16MB	16MB
1 year parts and labor	1 year parts and labor	1 year on-site service	1 year parts and labor	1 year parts and labor	1 year parts and labor	1 year parts and labor	1 year parts and labor	1 year parts and labor
B	B	B	B	B	A	B	B	B

■ 12-MHZ ATs

They've used a slow 65-millisecond hard drive, minimal standard memory, and an acceptable but less-than-the-best video configuration to keep the price down. Later on you can yank the slow drive and video system, put in higher-performance units, and load up the system memory to get the beefed-up machine you always wanted.

The warranties for Advanced Logic Research computers cover parts and labor for 1 year. All sales are through dealers or OEM accounts, but if end users have to send a machine back to the factory for servicing, ALR pays for shipping one way, matching the mode of shipment used by the customer.

The Dart's user and technical manual is super. It has large type, lots of white space, clear language, and line drawings. This manual doesn't cover DOS or BASIC or anything other than how to set up and configure the computer, but it does the best job I've seen yet. Other vendors should buy copies of this manual just to see how well it can be done.

If you look at the specs moderately closely, you'll realize that the Dart, while one of the lowest-priced complete systems reviewed in this batch, may not make sense on a dollar basis alone. All of the other systems use EGA or better, and most have faster drives and more memory. What you get here, however, is a competent, name-brand machine, complete with status and the ability to reconfigure the basic box to get a quicker drive or hotter video system later if you really need it. ALR wanted an entry-level system, and it looks as if it's got a good one.

AMAX ENGINEERING CORP.

Amax PC/286

There are no surprises here, at least no bad ones. The last thing you want when you buy a computer from a relatively new or small computer vendor is to find no-name parts or shoddy fit and finish. The major reason to buy an off-brand machine is to save money, not create anguish. Amax Engineering Corp's Amax PC/286 saves you worry by offering a good deal and brand name parts.

The Amax PC/286 is a 12-MHz zero-wait-state machine, and the unit we tested



The Amax PC/286 is a lot of computer for the money; the company took no shortcuts in equipping this conventional AT with solid, brand-name components. A stripped-down system with 512K RAM goes for \$1,095.

included 1MB of 80-nanosecond RAM. Its large AT-style case uses the standard-configuration motherboard with no I/O ports—they're all on interface cards in expansion slots. Since this machine is basically a standard AT clone, albeit faster, one of the factors in judging its value is the quality of the components used.

Amax Engineering hasn't taken any shortcuts with no-name components, although it hasn't gone overboard with deluxe ingredients, either. The Amax PC/286 uses an Intel 80286 microprocessor with Phoenix Technologies' ROM BIOS. Setup is accomplished with a diskette rather than in ROM, which is a minor disappointment, easily forgotten once installation is over.

As configured for testing, the machine came with a 40MB 28-millisecond Seagate hard drive, a VEGA VGA card, a Samsung multiscanning EGA monitor, a Western Digital combination floppy-and-hard-drive MFM controller, one parallel port and one 9-pin serial port, and a Maxi-Switch keyboard. The test configuration

also included both a 1.2MB 5¼-inch and a 1.44MB 3½-inch floppy drive. The total list price including DOS and GW-BASIC is \$2,450.

The Amax PC/286 comes in a big box and has a full set of slots, two 8-bit and six 16-bit. The 200-watt power supply has four device connectors. There are five half-height drive bays, three of which are accessible from the front of the case. The relatively standard test-machine configuration left five slots free for future expansion. The case itself looks and feels solid, and everything fits well.

The performance figures weren't surprising, either; the Amax PC/286 scores were right in line with the other zero-wait-state 12-MHz machines.

The Amax warranty covers 1 year on parts and 90 days on labor, a good reason to pray for early electronics failure. Because labor is covered for only 90 days, it may not be a bad idea to run this machine to death at first to encourage a borderline part to exhibit its weakness.

The Amax PC/286 has a brand-new



FACT FILE

Amix PC/286

Amix Engineering Corp.
47315 Mission Falls Ct.
Fremont, CA 94539
(415) 651-8886

List Price: With 512K RAM, 1.2MB 5¼-inch floppy disk drive, \$1,095; with 1MB RAM, 40MB hard disk, monochrome card and monitor, DOS 3.3, \$2,195; with VGA card and monitor, \$2,309; with 1.2MB 5¼-inch and 1.44MB 3½-inch floppy disk drives, VGA card, and EGA monitor, \$2,450.

In Short: Amix's PC/286 system combines standard high-performance parts to come up with a good deal for the money. This no-tricks 12-MHz zero-wait-state unit in a big system case is the computer you might put together yourself if you were spending your own money. Amix has done it for you and warrants the whole thing.

CIRCLE 881 ON READER SERVICE CARD

manual that is literate, instructive, and complete. It starts with a sensible overview of computers and how they work and then leads into setting up the system and using both DOS and BASIC. The manual also has a helpful troubleshooting and diagnostics section as well as drawings and sketches of all standard components and boards. It's a pleasure to see a small vendor put such obvious stress on intelligent information for lay people.

The only proprietary component in the Amix is the motherboard. If it fails, at this price you could throw away the motherboard, keep the other components, and probably still be ahead of the game. Then you just buy a standard motherboard of your choice and plug in all of the leftover components, and you'll be up and running. If all this talk about plugging and unplugging parts and pieces sounds threatening, you probably should think in terms of buying through a dealer.

Amix Engineering is not a large company and doesn't yet have a huge rep as a clone maker, but it has assembled a respectable performer at a good price. If you don't need the hand-holding that only a local dealer can provide, this is the kind of company that will provide you with a good deal on a solid machine with name-brand parts.

AMERICAN RESEARCH CORP.

ARC ProTurbo 286

"Where'd everything go?" The first time you look inside an ARC ProTurbo 286, you might have to fight the impulse to call tech support and ask this. It looks as if pieces are missing. If you know better or look more closely, this system's integrated design provides the answer: most standard peripheral interfaces are built right onto the motherboard.

By using chips on the motherboard rather than cards in interface slots, the ProTurbo 286 runs cooler, requires a smaller power supply, and uses a small system box. With this unit you still have the five free interface slots that most AT-class machines have available after installing a drive controller, an I/O card, and a video card. An added benefit is that the components integrated directly onto the motherboard are able to run at full processor speed, in this case 12 MHz, without having to slow down to the 8-MHz bus speed

to which the add-in boards are limited.

The ProTurbo 286 is a dual-speed 8/12-MHz system. It runs at a true zero wait state, requiring no tricks to emulate or get close to zero-wait-state performance. ARC makes its own motherboard and uses American Micronics' (AMI) ROM BIOS. You activate the setup program in ROM by hitting the Del key immediately after the power-on self-test.

In addition to the power supply, motherboard, and interface slots, there is room inside the system unit for three half-height storage devices, powered by a more than ample 150-watt supply with three device connectors.

The ProTurbo 286 comes standard with 1MB of 80-nanosecond RAM, an auto-switching EGA interface, one parallel port, and two serial ports—one 9-pin and the other 25-pin. The IBM Enhanced-style keyboard manufactured by Chicony America feels just a bit mushy but is acceptable. The tested unit also had a 50MB, 28-millisecond hard drive and an EGA



The ARC ProTurbo 286 may have only five expansion slots, but because the drive controller, the serial and parallel ports, and the video interfaces are all built onto the motherboard, the expansion slots are free in the standard configuration. Selling for \$2,045 with 1MB RAM, this system has an LED MIPS meter on the case front—initially interesting but ultimately distracting.



FACT FILE

ARC ProTurbo 286
American Research Corp.
1101 Monterey Tann Rd.
Monterey Park, CA 91754
(800) 423-3877

List Price: With 1MB RAM, 1.2MB 5¼-inch floppy disk drive, DOS 3.3, \$2,045; with 50MB hard disk, monochrome card and monitor, \$3,005; with EGA card and monitor, \$3,260.

In Short: ARC's ProTurbo 286 is a cardless system with all basic functions on the motherboard, including an auto-switching EGA chip set. The ProTurbo's small box is a crowd pleaser, with the exception of a distracting and unnecessary LED MIPS meter on the front.

CIRCLE 100 ON READER SERVICE CARD

monitor. The test configuration list price is \$3,260. Take away the hard disk and the monitor, and the price dips to \$2,045.

The ProTurbo 286's small case is easy on the eyes. The keyboard plugs into the bottom left of the unit's front; it's kept company by both reset and turbo switches. The on/off switch is also on the front, indicating a measure of trust on the part of the system's designers.

The only off-key design note is the relatively large MIPS meter that constantly tracks the processor functioning in millions of instructions per second. The three-digit LED display is distracting and of little practical use. While it is slightly interesting to observe how fast the computer performs various functions, that interest fades quickly, making the meter useful only as a turbo mode indicator; a simple light would suffice for this.

ARC has distributors and dealer sites throughout the world to provide local (or at least regional) service. The warranty covers parts and labor on the motherboard for 2 years and on the rest of the system for 1 year.

The ProTurbo 286's manual is terrific. It's slick but not offensive, using oversized graphics to clearly depict all system parts. It also includes reasonable levels of information on setup and configuration, DOS, error messages, and different installation options.

DISCRETE LOGIC vs. VLSI CHIP SETS

Ever ponder the circuitry alternatives computer makers have to choose from when designing your PC?

All personal computers share a group of basic components. Besides a microprocessor, PCs require oscillators and timers, interrupt and DMA (direct memory access) controllers, and a host of other circuits. When designing a new machine, computer engineers can choose between two options to bring these circuits and their functions to life: discrete integrated circuits and VLSI chip sets.

Discrete designs embrace an entire range of technologies, from basic logic elements such as AND and OR gates made from a few dozen transistors to complex high-level controllers that have tens of thousands of transistors etched into their silicon. The distinguishing characteristic of chips used in discrete designs is that they are general-purpose. The same interrupt controller might be used in a PC, a vintage CP/M computer, a numerical control system for a milling machine, or an intercontinental ballistic missile.

VLSI chip sets use the same integrated-circuit technology as discrete ICs, but they squeeze more functions onto a sin-

gle silicon wafer—from tens to hundreds of thousands of transistors. More important, VLSI chip sets are created for one particular purpose: to support the operation of IBM-compatible personal computers. They are sometimes called ASICs, or Application-Specific Integrated Circuits.

Chip sets make the computer designer's life easier because all the functions he needs are already put together in a few well-documented packages. However, he pays for this convenience both in cash and in flexibility. Chip sets can be more costly than discrete logic (someone has to pay for their development), and they tend to make all computers the same. The chip sets have the same functions in all computers that use them. If a designer wants to make his computer stand out, he has to go beyond the chip set into the realm of discrete logic. Consequently, many personal computer designs use both technologies: VLSI chip sets for the foundation and discrete logic to enhance performance or add special features.

—Winn L. Rosch

The only major limitation of the unit is inherent in its design. If one of the surface-mounted parts breaks, the whole box is down. But surface-mounted units are generally more reliable than bus designs, largely because they run cooler and have fewer components, so the trade-off is obvious and favors the integrated design. That doesn't help much if your drive controller goes floeey, but it's probably an indication of the future direction of system architecture.

Most small-format system boxes are relegated to single-user workstations. By using peripheral interfaces on a chip, the ARC ProTurbo 286 gives you as much expansion room as a standard big-box ma-

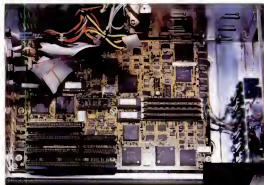
chine without taking up all the valuable desk space. Ignore the MIPS meter and check this one out.

AUSTIN COMPUTER SYSTEMS

Austin 286/12.5

"Less is more." "Good things come in small packages." "Watch out for the little guy; he's a fast one." All these clichés apply to the Austin 286/12.5. This computer from Texas fits in a small case and uses surface-mount technology, integrated controllers, and VLSI chip technology to provide good performance at a low price, without taking over your desktop.

The Austin 286/12.5 uses Western Dig-



The Austin 286/12.5 offers 1MB RAM, a 20MB hard disk, and a monochrome display for only \$1,895. This small-footprint computer uses a Western Digital motherboard with drive controller, parallel and serial ports, EGA video interface, and PS/2-compatible mouse port all on the motherboard, saving expansion slots for other options.



BIOS from Phoenix Technologies; setup is in ROM, the preferred method.

The Austin 286/12.5 comes in a small case with four expansion slots, one 8-bit and three 16-bit, and room for four half-height storage devices. The 180-watt power supply has four device connectors.

The computer is covered by a 1-year parts-and-labor warranty, which is fairly standard. In addition there's a General Electric on-site service contract, in case you have a problem that can't be solved over the phone. According to the vendor, most problems are completely resolved within 24 hours, even if a service call is required. You may not have heard of Austin Computer Systems, but G.E. is a familiar

**Austin provides
a General Electric
on-site service
contract for
problems that can't
be solved by phone.**

PC MAGAZINE
EDITOR'S CHOICE
FACT FILE

Austin 286/12.5

Austin Computer Systems
7801 N. Lamar, #E-198
Austin, TX 78752
(800) 752-1577

List Price: With 1MB RAM, 20MB hard disk, 1.2MB 5¼-inch floppy disk drive, monochrome monitor, DOS 3.3, \$1,895; with 40MB hard disk, \$1,995; with EGA monitor, \$2,395.

In Short: Austin Computer Systems has a winning combination of classy parts, smart design, high performance, and aggressive pricing, all backed by a GE on-site service contract. How can you lose?

CIRCLE 111 ON READER SERVICE CARD

ital's highly integrated motherboard. The four expansion interface slots are free because everything you need for the basic system is built onto the board, including a high-performance drive controller and

Paradise auto-switching EGA circuitry.

The computer's processor runs at either 6.25 or 12.5 MHz, while the computer's expansion bus maintains a conservative 6.25 MHz. Also standard and on the board are a PS/2-compatible mouse port, one parallel printer port, and two serial ports.

This is not a zero-wait-state box—the fastest it can go is with one wait state—but by using a fast drive controller and shadow-RAM technology, the computer performs extremely well, especially since all of the components on the motherboard buzz along at 12.5 MHz.

The motherboard can hold a total of 4MB of memory, saving you from having to buy expansion cards and keeping the slots free as well as allowing the memory to work at full clock speed. The computer comes with 1MB of 80-nanosecond RAM standard. If you need to go above 4MB, the system can attain a total of 16MB, using expansion boards for the upper 12MB.

The processor chip is by Intel and the

name. This arrangement is a doubly smart move for Austin since it gets the credibility of being associated with an internationally known company but doesn't have the aggravation and expense of an in-house physical service facility.

The user reference manual provides extraordinarily complete but not overwhelming documentation. It's not slick, but it is good.

If you don't like the parts Austin uses in the 286/12.5, you'll have to look elsewhere. And if a part breaks, your whole machine may go down as well (though the on-site service contract lessens this threat somewhat). These two limitations are the only concerns I'd have about buying or recommending an Austin to users.

The Austin 286/12.5 is an excellent buy. With the on-site service from G.E., this may be the 286 workhorse to go for.

GIVE US HALF AN HOUR AND \$299 AND WE'LL GUARANTEE YOU A FULL FEATURED NETWORK.

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An inexpensive way to turn your fragmented, unsociable collection of computers into a fully functioning network, sharing resources like laser printers and high speed processors, making files and data available to everyone who needs them, and substituting electronic mail for those little scraps of paper and expensive copies.

FRIENDLY LAN

As easy as MainLan is to install, it is even easier to use. The menu system lets you spend your time working instead of learning how to make it work. If, for instance you want to transfer or manipulate files, redirect printer output, or send E-mail, just press the appropriate key.

MainLan is so friendly, in fact, that it's almost not there. When you're using an applications program or dealing with data on another computer, MainLan is transparent, unobtrusively doing its job. There when you need it...out of sight when you don't.

It also has a thoughtful modular design that helps you conserve your RAM for programs you need. You can be a full-fledged member of the network while using as little as 50k.

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COMPATIBLE LAN

There's no reason to limit your software choices. MainLan is true NETBIOS compatible. So you can run any of the popular network NETBIOS-compatible applications programs without modification.

THRIFTY LAN

MainLan is easy on your pocketbook, too. Our unique hardware design is much less costly to produce and you get the savings.

And remember, you won't need an expensive file server—MainLan offers you the choice of dedicated or non-dedicated

servers. It gives you the chance to save hundreds of dollars.

But don't get the impression that you sacrifice essential LAN features. Not so! You get an effective, easy-to-use way to share resources and data, that gets the job done in true network fashion.

LAUDABLE LAN

But don't just take our word on it. "PC World" in England says "MainLan is a revolutionary way of operating in a multiple machine environment without having to make all of the usual sacrifices. It has the potential to be the low-cost networking standard of the

future." The kind of features which persuaded the judges to award MainLan the PC MAGAZINE EDITOR'S AWARD at the 1988 British Personal Computer Awards. That's MainLan.

THE FEATURES

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PC NETWORK SYSTEMS

■ 12-MHZ ATs

DELL COMPUTER CORP. Dell System 200

How can an upstart vendor be a conservative choice? Simple. Take a Texas company that has been selling computers like crazy since 1985 and is largely credited with legitimizing buying computers by mail. Add toll-free technical support, standard on-site service contracts, and a 30-day money-back guarantee. Finish with a full line of computer systems, peripherals, and supplies, and the picture begins to clear. Dell Computer Corp., originally known as PC's Limited, is no longer a maverick solution. Its computers aren't priced as aggressively as they used to be, but the quality has improved.

The Dell System 200 is a 12.5-MHz computer that can also run at 6.25 or 8.33 MHz when necessary. The system bus runs at either of the two slower speeds. The System 200 operates with one wait state and comes with 120-nanosecond memory chips. Dell manufactures its own system board and uses Intel chips and the Phoenix ROM BIOS, in this case with the system configuration setup program in ROM. Dell uses no speedup techniques such as memory interleaving or shadow RAM with this computer, but the computer gets a



Dell Computer Corp. goes the extra distance to inform users about every aspect of the Dell System 200. This decal, appearing on top of the disk drives, clearly notes the layout of system components. With 640K RAM, this computer sells for \$1,549.



FACT FILE

Dell System 200

Dell Computer Corp.
9905 Arboretum Blvd.
Austin, TX 78759-7299
(800) 426-5150
(512) 338-4400

List Price: With 640K RAM, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy disk drive, \$1,549; with 1MB RAM, 40MB hard disk, monochrome card and monitor, DOS 3.3, \$3,169; with VGA card and monitor, \$3,569.

In Short: The Dell System 200 is a 12.5-MHz one-wait-state computer that can also run at 6.25 or 8.33 MHz. The System 200 shares the Dell family's wide range of accessories and upgrades, toll-free telephone support, and on-site service warranty from Honeywell Bull. This vanilla system has no tricks, but you can expand the motherboard memory to 4.6MB without adding expansion cards.

CIRCLE 888 ON READER SERVICE CARD

slight performance edge on some tests because the 12.5-MHz processor clock is slightly faster than one found in a 12-MHz unit.

The large-style system box has five disk-drive bays, with power leads for four units from the 200-watt power supply. There are six expansion slots, two 8-bit and four 16-bit. The standard parallel and two 9-pin serial ports don't use an expansion slot, since their interfaces are built into the motherboard. With a video card and combination floppy-and-hard-drive controller taking up two slots, four slots remain for other options.

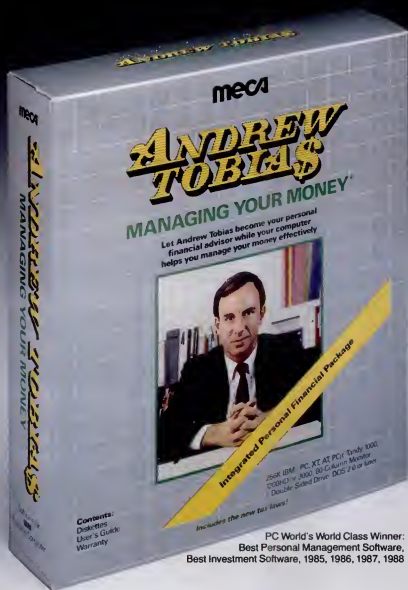
You won't use any of the slots for memory unless you need gobs of it, because the motherboard can take an additional 4MB of memory above the standard 640K. This

brings the total motherboard memory potential to 4.6MB and the system potential to the standard 16MB if you do add memory cards.

The standard system comes with one floppy drive. You can specify either a 1.2MB 5¼-inch or a 1.44MB 3½-inch device. The tested unit came with a 40MB 28-millisecond hard drive, and a VGA video system including the adapter card and a Mitsubishi monitor. The total system price as configured, including DOS, comes to \$3,019.

The Dell System 200 is backed by a 1-year parts-and-labor warranty. When something goes wrong, you don't have to worry about packing the machine and shipping it to Texas. According to a Dell spokesperson, 94 percent of the reported

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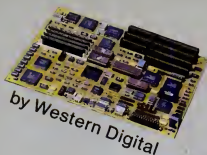
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■ 12-MHz ATs

problems are resolved over the toll-free technical support phone lines. For those instances where more-knowledgeable hands and eyes must check out the computer, the warranty includes a 1-year, on-site service contract with Honeywell Bull, a nationwide computer service firm.

The on-site service plan is referred to as optional, but you have to elect *not* to get it, which very few customers do. The service contract and warranty can be extended to up to 5 years at an approximate annual cost of 10 percent of the system's original retail price. The System 200 also includes very good documentation, which covers system components, installation, configuration, and troubleshooting.

You might not buy the System 200 on price and hardware specifications alone, because you can beat the deal. However, Dell Computer has become one of the country's major computer vendors. Its systems come with more than just the numbers; the added reassurance of the toll-free support line, the on-site service contract, and the company's growing reputation are further values to consider.

EPSON AMERICA INC.

Epson Equity II Plus

What's in a name? Quite a bit in the computer hardware industry, especially when the name has high recognition. In a world where any name but IBM raises questions, a company whose name has been associated with microcomputers since the early days (read early eighties) has an edge. Epson America has long been the major microcomputer printer vendor and supplier. The company has also manufactured and sold computers for several years. The Epson Equity II Plus, a slight upgrade from the previous version, hasn't added much to the older model. But since it's made by Epson and is supported by the company's wide network of dealers and service centers, it's a viable contender as a single-user machine or workstation.

The new Equity II Plus has an upgraded microprocessor clock. The previous version had a top speed of 10 MHz, but the current model works at either 8 MHz or 12 MHz with one wait state. There are no tricks like memory interleaving or shadow RAM to increase the speed to closer to



The Epson Equity II Plus comes with 640K RAM for \$1,899. You'll find the keyboard plug, the reset switch, and the processor speed switch all conveniently mounted on the front of the machine.

zero-wait-state operation. The expansion bus runs at a constant 8 MHz. The ROM BIOS is proprietary to Epson. This is fine, since it proved IBM AT compatible, but the setup program is not in ROM; it's on a separate diskette.

It's not really that big a deal when setup is on diskette rather than in ROM, although being able to change system configuration conveniently is a boon. A greater problem with the Epson setup program is that it isn't always clear.

The manual covers the process of using the setup program, but the program itself should be intuitive and it isn't. The most salient example of obfuscation concerns setting up the Epson to work with an EGA adapter card and monitor. The setup program offers the user four choices of monitor type: Special Options, Color/graph. 80 col, Color/graph. 40 col, and Monochrome 80 col.

The problem is that Special Options looks like a heading, when it's really a choice. To choose EGA you're supposed to select Special Options, and then the



FACT FILE

Epson Equity II Plus

Epson America Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(800) 922-8911

List Price: With 640K RAM, 1.2MB 5¼-inch floppy disk drive, DOS 3.3, \$1,899; with 1MB RAM, 40MB hard disk, monochrome card and monitor, \$3,288; with 640K RAM, EGA card and monitor, \$3,897.

In Short: The Equity II Plus now has a microprocessor clock, boosted to 12 MHz from last year's 10-MHz version. The performance times are up accordingly, but otherwise this computer remains the same: a competent, small-footprint machine from a major vendor, with a list price a bit high compared with those of most machines reviewed here.

CIRCLE 667 ON READER SERVICE CARD

computer will look to the video adapter board for the proper settings. This process is explained adequately in the manual in a parenthetical note, but not clearly indicat-

■ 12-MHZ ATs

ed at all on the Setup screen itself. Until you figure out how it's done, you get error messages telling you to run SETUP every time you start the computer—a disconcerting message, since you think you've taken care of it.

The Equity II Plus's small-sized system case is fairly attractive. The keyboard plug, the power switch, and the reset and processor speed switches are all on the front. There are six expansion slots, three 8-bit and three 16-bit. In standard configurations, three of the slots are open.

The unit holds up to three half-height drives, with power leads for those three coming from the 140-watt power supply. Of the three possible drives, two can have exposed fronts.

The Equity II Plus's standard 640K 100-nanosecond RAM is the maximum the motherboard can take. The machine is expandable to 16MB, using memory-expansion cards, but you have to buy the cards separately, and the additional memory is limited by the 8-MHz bus speed. One parallel and one 9-pin serial port and a 1.2MB floppy drive come standard. The tested unit also had a 40MB 28-millisecond CDC (Central Data Corp.) hard drive, an EGA video adapter card, and an Epson EGA monitor.

All of the Epson computers use the same keyboard, and it's a nice one; it looks and feels durable and has good keystroke action with an audible, mechanical click.

Epson computers are sold through dealers. A nationwide network of authorized service centers honors the standard 1-year parts-and-labor warranty. An extended warranty for \$99.95 gives you an extra year's coverage for all Epson components purchased with one computer system at one time.

Because of limited open slots and minimal on-board memory potential, this machine is suitable only as an individual workstation, either standalone or on a network. The Epson Equity II Plus's performance is fine for its class and for today, but this is not a machine to buy if you plan on expanding or upgrading in the near future. Consultants often recommend this machine for nonpower users because of the mix of features, price, performance, brand recognition, and local service. It makes sense for lots of users.

INDTECH SYSTEMS INC.

IndTech 286 5192 Power Series

Here's one that's hard to call. IndTech Systems rolls its own motherboard and ROM BIOS, and usually sells both in a case with a power supply to other vendors or value-added resellers (VARs) that combine other components and software for specialized systems. Since end users do occasionally buy directly from IndTech, it makes sense to review the machine. I'm just not sure why anyone would buy one, given the 5192's average performance levels and the sparse number of components provided.

The IndTech 286 5192 Power Series is a 12-MHz, zero-wait-state computer with a 238-watt power supply in a big case with 12 expansion slots, six 8-bit and six 16-bit. Four of the 8-bit slots, however, are only

half-length, limiting their usefulness to shorter add-on cards. The system setup program comes on a diskette, a minor inconvenience, though it matches the method used on the IBM AT.

The 5192 performed as expected for its component specifications on the benchmark tests. The tests accessing the hard drive were particularly slow since the 20MB hard drive IndTech Systems supplied (but does not sell) was rated at only 65 milliseconds. IndTech uses no caching or RAM shadowing, although it does use interleaved memory.

The modest documentation is clearly written and covers installation and configuration, but it does not go into detail about full-system configuration since the company usually doesn't provide all the parts.

The large-style computer case is plain-looking and will accommodate five half-height storage devices. The power supply



The IndTech 286 5192 Power Series is usually sold to system integrators who add parts to come up with complete systems. Little comes standard with this computer, which costs \$1,738 for a system configured with 512K RAM. While this computer has 12 expansion slots, the four 8-bit slots next to the power supply are half-length, limiting expansion possibilities.



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FACT FILE

IndTech 286 5192 Power Series

IndTech Systems Inc.
1349B Moffett Park Dr.
Sunnyvale, CA 94089
(408) 743-4300

List Price: With 512K RAM, 1.2MB 5¼-inch floppy disk drive, \$1,738.

In Short: You have to love IndTech's motherboard or BIOS to take a chance on this one; most of IndTech's sales are to OEMs or VARs, few to actual users. The IndTech 5192 doesn't come standard with a keyboard, and the company doesn't sell hard disk drives, video cards, or monitors. The zero-wait-state 12-MHz system unit performed at average levels but didn't offer any compelling reason to buy it.

CIRCLE 666 ON READER SERVICE CARD

has four device connectors.

The 5192 comes with very little; basically you're buying a box in which to put other components. Our test machine originally arrived without a keyboard or any components installed in the case other than the motherboard and the power supply. After a call, a sales rep came by and put in a drive controller and floppy and hard drives and installed a keyboard. We tested the machine with a borrowed video card and monitor.

IndTech Systems provides a 1-year parts and labor warranty to the end user, with the customer paying for shipment to the factory in California. IndTech ships it back to you using the same method you used; if you use UPS Red service for express overnight delivery, you get it back the same way.

Don't look to this vendor for a lot of hand-holding—the company's orientation clearly is not toward end users. You will probably be on your own unless you have a problem specifically connected with the motherboard and happen to isolate that problem quickly.

The 5192 is probably best left to the system integrators who use it as a basic component. It functions competently, but the price/performance/component ratio works against it for retail purchasers. I can't recommend this machine for end-user purchase.

KAYPRO CORP.

Kaypro 286i Model C

Component roll call takes on a new meaning with Kaypro's 286i Model C. When you look in the expansion slots, you'll find an unfamiliar card. Closer observation proves it to be a processor card. In fact with the Kaypro series, practically everything is on expansion cards. This design is both a boon and a concern for potential Kaypro customers.

With everything on the bus, the conflict centers around upgradability. If 2 years down the road you decide to upgrade to a 386 processor board, all you have to do is replace the processor board. That's fine under two conditions: that the upgrade board is cost-effective at the time of purchase and that Kaypro still makes them.

It's hard to tell what system designs will prevail even a year from now. The current systems will probably still work and be supported, but nonstandard current architecture makes it chancier that there will be clear, cost-effective upgrade paths.

Even today, when 80386 processor boards are available and follow current standards, the upgrade is not inexpensive. The list price from an upgrade to the Kaypro 16-MHz 80386 processor board is \$2,100, although dealers will often allow a \$500 trade-in, according to Kaypro. A \$2,100 upgrade cost (or \$1,600 with trade-in), in addition to a \$3,095 base machine cost that doesn't include video card or monitor, is expensive iron.

Kaypro says it will offer an 80386SX daughterboard that will plug into the standard 80286 processor board, but this has not been released yet and pricing was not available at the time of this review.

All told, it sounds as if the bus design is an interesting idea that may pay off, but there's uncertainty too. It would be safest to consider this machine not for its future potential but for its current merits.

The 286i Model C does have lots of present value. When you purchase the machine, you can specify whether you want a 12-, 16-, or 20-MHz processor clock. It costs an extra \$500 for each higher speed level. The reviewed machine uses the 12-MHz clock chip, which can also be set to 6 MHz from the keyboard if you need to slow the system for software or peripheral

compatibility. The Kaypro runs with one wait state, but with a combination of memory interleaving and shadow RAM, you can increase the speed significantly, though the machine cannot attain true zero-wait-state performance.


Kaypro makes its own motherboard and processor board but uses microprocessor chips by either AMD (Advanced Micro Devices) or Intel Corp. The vendor also utilizes Phoenix Technologies' ROM BIOS technology and has the setup program in ROM. Setup is invoked with the four-key combination Ctrl-Alt-Shift-Tilde. While in setup, you can use the PgUp key to get to the NEAT CHIPset menu; this configures memory and enables or disables various configurations and options like shadow RAM.

As far as upgradability goes, Kaypro's design is both a boon and a concern for potential users.

The NEAT CHIPset allows lots of flexibility of memory allocation, and the system can be configured for LIM 4.0, EMS, or EEMS memory use, but if you use the shadow RAM options, you cannot use the 384K of RAM between 640K and 1,024K for extended memory. If you have gobs of memory, that's no big deal. If you have the standard 1MB and want both the fastest performance possible and the advantage of extended memory, you're out of luck.

The standard 1MB of 120-nanosecond RAM is expandable to 8MB on the motherboard, using 1MB SIMM chips, all of which can run at full processor speed. An additional 8MB can be installed on optional memory cards.

The Kaypro comes in a big box with a total of 11 screws to hold it together. The



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CIRCLE 117 ON READER SERVICE CARD



The basic system of the Kaypro 286i Model C sells for \$3,095 with 1MB RAM and a 40MB hard disk. This machine makes no bones about securing the case; it takes 11 screws to open or close the system box. While this design is certainly solid, opening and closing the computer can become exasperating.



machine has FCC class B certification, but perhaps Kaypro needed the extra tightness from all the screws in order to get it?

The large case has room for six half-height devices, as well as power-supply connectors for four. Since the case has removable bezels, all six devices that you install can display their fronts.

There are nine expansion slots, three 8-bit and six 16-bit. In the test machine, a typical configuration with a processor board, a floppy-and-hard-drive controller, a video display card, and an I/O card, five slots were free.

The keyboard lock sensing unit was broken on our test unit. We were able to get around that obstacle with some judicious soldering, but in the process, we noticed that the cable from the keyboard con-

nect (in the rear of the machine) to the lock was resting on a relatively hot 10-watt resistor set into the motherboard. This resistor was too hot to touch and should not be in contact with any cables.

One parallel and one 9-pin serial port come standard, as does a combination floppy-and-hard-drive controller. The Model C also comes with a 1.2MB floppy drive and a 40MB 28-millisecond hard disk.

The test configuration included an EGA card and a Samsung EGA monitor wearing a Kaypro label. By configuring the memory to shadow both the BIOS ROM and the Video ROM, display speed times were very good.

MS-DOS 3.3, GW-BASIC, Super-Switch (a video control program), and Mi-



FACT FILE

Kaypro 286i Model C

Kaypro Corp.
533 Stevens Ave.
Solana Beach, CA 92075
(800) 4-KAYPRO
(619) 481-3991

List Price: With 1MB RAM, 40MB hard disk, 1.2MB 5¼-inch floppy disk drive, DOS 3.3, Microsoft Works, \$3,095; with monochrome card and monitor, \$3,339; with EGA card and monitor, \$3,919.

In Short: The Kaypro 286i Model C is a specific configuration of an open system that offers many options, including different processor boards. This configuration performs well and has plenty of room for expansion, including up to 8MB of memory on the motherboard. The price is in line with those of other major national brands, but the nonstandard system architecture is a concern.

CIRCLE 888 ON READER SERVICE CARD

crosoft Works are all standard issue.

The price for the totally configured test machine is \$3,919, making the Kaypro one of the most expensive of the machines tested in this roundup.

The Kaypro warranty covers parts and labor for 1 year. Most Kaypro sales are through dealers who service the machines, although Kaypro has begun selling directly to end users. Kaypro pays both shipping costs for warranted service for end users who purchase computers directly from the manufacturer and can't or don't get local service.

Kaypro's bus concept is a fine idea and not unique to Kaypro. However, with the higher end of the microcomputer market currently in a state of confusion over the direction of 386 architecture, buying a machine just for the bus is risky. Other than that factor, the 286i Model C is a solidly performing, expandable machine from an established vendor.

PAN-UNITED CORP.

Micro Lab 286/12

Here's a classic clone with no surprises. Though you'll buy the Micro Lab 286/12 for a low price (certainly not for status) your money gets you brand-name components in a large system box with ample

■ 12-MHZ ATs



The no-surprises Micro Lab 286/12 sells for \$1,197 with 512K RAM. A classic clone in a big box, this machine offers brand-name components with plenty of room for expansion, all at a low price.

room for future expansion.

The Micro Lab 286 is a 12.5-MHz, zero-wait-state machine with an Intel processor and Phoenix Technologies ROM BIOS. The Phoenix system-setup program resides in ROM, conveniently accessed at any time by holding the Ctrl and Alt keys and pressing the Esc key. The standard 512K memory consists of 100-nanosecond chips, which are the slowest recommended for the speed at which this system runs. The microprocessor runs at either 6 or 12.5 MHz, while the expansion bus runs at a constant 8 MHz to ensure compatibility with interface cards and with application software.

Pan-United Corp. doesn't use disk caching or shadow RAM or any other tricks to enhance performance, which is probably just fine for most users. The machine's performance results were all just as expected: right in line with similarly equipped machines but slower than those that use caching or put the video BIOS into RAM.

The Micro Lab 286/12 comes in a big box with room for five half-height devices, three of which can show from the front. There are, however, four device connectors coming off the 200-watt power supply, so you can power up only four internal data-storage devices. There are eight expansion slots on the motherboard, two 8-bit and six 16-bit slots; five slots were free in the configuration tested. There's nothing particularly remarkable here, but there are no unhappy surprises, either.

The Micro Lab 286/12 comes with one parallel and one serial port, a Key Tronic Enhanced AT-style keyboard, a Western Digital standard MFM combination floppy-and-hard-drive controller, and a 1.2MB floppy drive as standard equipment. The tested unit also had a 40-millisecond, 40MB hard drive, an EGA board, and a Samsung EGA monitor. MS-DOS 3.3 costs an additional \$95. The tested unit costs \$2,242 with DOS.

Pan-United offers a 1-year parts-and-labor warranty. For servicing you must



FACT FILE

Micro Lab 286/12

Pan-United Corp.
1967 Rt. 27, #12
Edison, NJ 08817
(201) 906-8044

List Price: With 512K RAM, 1.2MB 5¼-inch floppy disk drive, \$1,197; with 1MB RAM, 40MB hard disk, monochrome card and monitor, DOS 3.3, \$2,167; with EGA card and monitor, \$2,242; with VGA card and monitor, \$2,907.

In Short: Pan-United's Micro Lab 286/12 uses standard components in a large AT-style system unit. The Micro Lab 286/12 is the kind of machine you buy for price; in this case the price/performance ratio is very favorable if you need little support and can do your own troubleshooting.

CIRCLE 64 ON READER SERVICE CARD

ship the machine to the company in New Jersey, paying shipping charges one way.

The Micro Lab's motherboard documentation, all that's provided, lends itself to creative translation. If you need it for more than basic information about the motherboard, you're in trouble before you start. One of the more interesting parts of the manual is the section on hooking up a reset switch. Apparently the authors take data loss very seriously because they add this comment: "Remark: Please be careful about this switch better put at fear part of computer, don't touch it when it unnecessary [sic]." Who said technical documentation isn't fun reading?

Most Pan-United sales are direct to end users through mail order, so you must ship the whole unit or individual components back if there's a problem, resulting in at least 2 days of downtime if you don't have another machine. The Micro Lab 286/12 isn't for people who need hand holding or immediate service, but for those who want to save money and can do their own troubleshooting, this could be the way to go.

It's a competent AT clone that runs along quite happily at 12.5 MHz with zero wait states. This machine was a good buy in its earlier 10-MHz version and continues to deliver good value with the faster 12.5-MHz clock. Pan-United's use of standard-brand parts lowers the mail-order risk factor to a negligible level.



"The Dateworld 286 [12MHz] AT compatible... [is]... the fastest machine of the nine tested in that review [July 1988]."
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DATA-286 12MHz

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Phoenix BIOS std. (Award BIOS opt.)
512KB of RAM, expandable to 1MB on board
Socket for 80287-8, -10
200W power supply
Real-time clock with battery backup
1.2MB floppy disk drive
Floppy/hard disk controller
(1:1 interface controllers available)
101-key keyboard with "click"
Mono card w/parallel port (720x348)
TTL monitor with tilt/swivel base

\$1195



Portacom II

80286 running at 8/12MHz, 0/1 wait state
Phoenix BIOS std. (Award BIOS opt.)
512KB of RAM, expandable to 1MB on board
Socket for 80287-8, -10
Real-time clock with battery backup
1.44MB 3.5" floppy disk drive
20MB, 39ms, self-parking hard drive
102-key keyboard with "click"
Supertwist backlit LCD, 640x400 res.
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Weights under 20 lbs.
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DATA-286 20MHz

80286 running at 10/20MHz
AWARD BIOS std.
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EMS 4.0 support for memory over 1MB
Socket for 80287
200W power supply
Real-time clock with battery backup
1.2MB floppy disk drive
1:1 interface floppy/hard disk controller
101-key keyboard with "click"
Mono card w/parallel port (720x348)
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DATA-386

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Phoenix BIOS std. (Award opt.)
220W power supply
1.2MB floppy disk drive
Floppy/hard disk controller
101-key keyboard with "click"
Five 16 and two 8-bit slots
Mono card and monitor **\$1995**



Portacom I

80286 8/12MHz, 0/1 wait
Phoenix BIOS std. (Award opt.)
512K RAM (exp. to 1MB)
200W power supply
1.2MB 5.25" floppy drive
20MB hard disk drive
Supertwist backlit LCD
RGB output port
5 expansion slots
1 parallel, 2 serial ports **\$1675**



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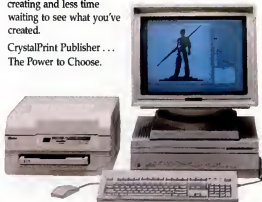
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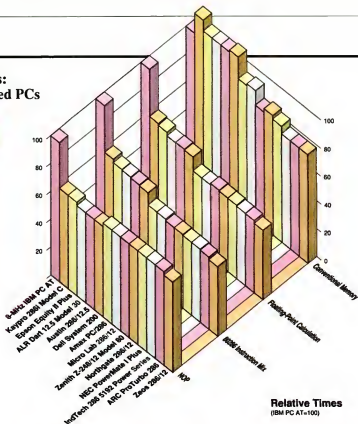
■ 12-MHZ ATs



Benchmark Tests: 12-MHZ 286-based PCs

Processor and Memory Benchmark Tests

These 80286 computers arrived with no expanded memory, and only 5 of the 13 contained extended memory; therefore, no results appear for Extended Memory or Expanded Memory tests. PC Labs' NOP test indicates that all processors (except that in the IBM AT) are running reliably at 12 MHz. System operating speed, however, varies to a greater extent, with those at the bottom of the list showing the most efficient operating environment.



The NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The 80286 Instruction Mix benchmark test measures the time it takes to execute a selected series of processor-intensive tasks. The test program uses 80286 instruction code. These instructions are a subset of the total processor instruction set.

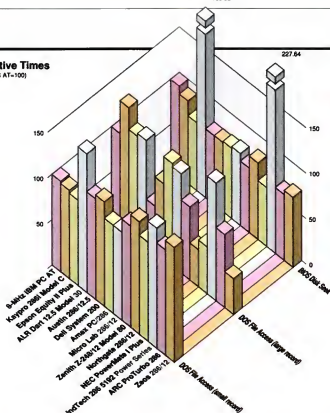
The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The benchmark program uses the floating-point library included with Microsoft C Compiler 4.0.

The Conventional Memory benchmark test allocates 256K of conventional memory and treats it as a series of 64-byte records. Then, 16,384 random records are read into and written from this memory. The result shown is the average of the read and write times.

Performance Times (Times given in seconds)

	NOP	80286 Instruction Mix	Floating- Point Calculation	Conven- tional Memory
8-MHz IBM PC AT	4.17	8.96	35.60	0.77
Kaypro 286i Model C	2.80	5.99	23.56	0.88
Epson Equity II Plus	2.80	5.77	23.18	0.82
ALR Dart 12.5 Model 30	2.70	5.73	22.30	0.82
Austin 286/12.5	2.70	5.68	22.41	0.82
Dell System 200	2.70	5.62	22.19	0.83
Amex PC/286	2.80	4.84	18.62	0.71
Micro Lab 286/12	2.80	4.83	18.62	0.72
Zenith Z-248/12 Model 80	2.80	4.72	19.01	0.64
Northgate 286/12	2.80	4.72	18.84	0.66
NEC PowerMate I Plus	2.80	4.67	18.78	0.64
IndTech 286 5192 Power Series	2.80	4.67	18.51	0.60
ARC ProTurbo 286	2.80	4.61	18.42	0.60
Zeos 286/12	2.70	4.45	17.69	0.80

Relative Times (IBM PC AT=100)



Performance Times

(Times given in seconds
except where noted)

	DOS File Access (small record)	DOS File Access (large record)	BIOS Disk Seek (milli- seconds)
8-MHz IBM PC AT	54.32	16.22	37.44
Kaypro 286 Model C	53.05	22.10	34.15
Epson Equity II Plus	51.35	18.20	28.01
ALR Dart 12.5 Model 30	83.18	18.73	71.11
Austin 286/12.5	60.55	8.25	28.38
Deft System 200	62.85	13.47	28.49
Amex PC/286	53.07	18.34	28.96
Micro Lab 286/12	53.02	17.74	29.64
Zenith Z-248/12 Model 80	60.91	13.07	26.63
Northgate 286/12	67.59	6.68	31.58
NEC PowerMate I Plus	59.54	8.42	24.29
IndTech 286 5192 Power Series	72.11	21.06	85.23*
ARC ProTurbo 286	63.28	13.12	27.21
Zeos 286/12	68.90	6.49	28.90

*BIOS Disk Seek times could not be reported for the IndTech 286 because of hard disk errors. DOS Disk Access time is shown.

Disk Benchmark Tests

The times resulting from the BIOS Disk Seek benchmark test are unaffected by disk caching. The test rates the physical, raw access speed of the drive; large- and small-record times are more indicative of data transfer rates.

The Zeos 286/12's high-speed hard disk drive yields predictably outstanding performance on the large-record test; at the same time, the Northgate, Austin, and NEC achieve comparably rapid scores while using disk drives that are not exceptionally fast. NEC uses a small buffer on the hard disk controller card to accomplish that feat; Austin maintains a 32K cache in RAM, and Northgate takes advantage of the faster access capability of an RLL-encoded hard disk. RLL has also helped throughput on the ALR Dart, which has an agonizingly slow hard disk compared with others in this group.

The DOS File Access benchmark test measures the throughput rate of the disk being tested. In this case, throughput times are measured in terms of how long the disk takes to perform common DOS file-management functions. Five tasks—file creation, sequential file write, sequential file read, random file write, and random file read—are timed and the results summed.

The test is carried out for two different types of files—small-record files and large-record files—that are used by common PC applications. Files created using small records are typically used by database management programs, and large records are typically used for word processing and spreadsheet files. Loading a DOS program is also simulated by the large-record test.

The BIOS Disk Seek benchmark test measures the time it takes to do a random seek using the disk's ROM BIOS. The test result includes minimal software overhead and may not parallel the manufacturer's claimed average access time. The test program performs 1,000 seeks. The average result is shown in milliseconds.

■ 12-MHZ ATs



Benchmark Tests: 12-MHz 286-based PCs

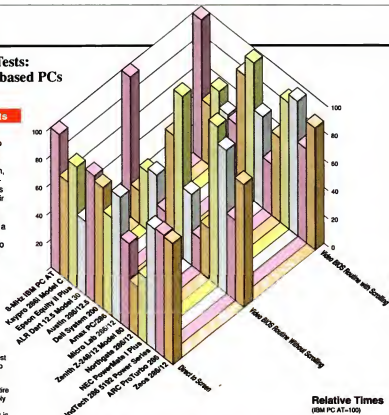
Video Benchmark Tests

The variety of video display cards included with this crop of machines makes it difficult to make meaningful comparisons among them. Kaypro and Austin, for example, owe their lightning-fast Video BIOS Routine speeds to video ROM shadowing in their EGA environments. Northgate and Zenith both supplied VGA systems. While Northgate uses a 16-bit interface card to its advantage during direct writes to the screen, Zenith shadows its video ROM for faster text handling than its EGA-based counterparts.

The Direct to Screen benchmark test measures the bandwidth of the video adapter by writing directly to the display memory buffer. The test is performed in video mode 3. The entire screen is updated using the assembly language REP STOSW instruction with register CX equal to 2000. This is done 1,000 times, and the result shown is the total of the 1,000 trials.

The Video BIOS Routine Without Scrolling benchmark test measures the speed of the BIOS Teletype routine without scrolling. The test is performed in video mode 3. The screen is cleared and 24 lines of 60 characters each (including a terminating carriage return and line feed) are written to the display through the BIOS Teletype routine. This is done ten times, and the result shown is the total of the ten trials.

The Video BIOS Routine with Scrolling benchmark test measures the speed of the BIOS Teletype routine with scrolling. The test is performed in video mode 3. The screen is cleared and 240 lines of 60 characters each (including a terminating carriage return and line feed) are written to the display through the BIOS Teletype routine. Although the first 24 lines written to the display do not involve scrolling, all the remaining lines scroll the display.



Performance Times

(Times given in seconds)

	Direct to Screen	Video BIOS Routine Without Scrolling	Video BIOS Routine with Scrolling
8-MHz IBM PC AT (EGA)	9.06	7.25	11.26
Kaypro 286 Model C (EGA)	6.43	1.70	4.85
Epson Equity II Plus (EGA)	7.85	3.02	6.59
ALR Dart 12.5 Model 30 (Hercules monochrome)	4.78	3.24	5.28
Austin 286/12.5 (EGA)	8.18	1.71	5.05
Dell System 200 (EGA)	7.87	6.01	9.54
Amaz PC/286 (EGA)	6.38	8.41	11.14
Micro Lab 286/12 (EGA)	8.13	3.68	7.36
Zenith Z-248/12 Model 80 (VGA)	5.60	1.76	4.12
Northgate 286/12 (VGA)	3.24	2.66	6.76
NEC PowerMate I Plus (EGA)	4.23	8.29	10.17
IndTech 286 5182 Power Series (EGA)	7.88	7.42	10.65
ARC ProTurbo 286 (EGA)	7.96	4.17	7.58
Zenith 286/12 (EGA)	7.87	6.37	9.83

NEC INFORMATION
SYSTEMS INC.

NEC PowerMate I Plus

Want to see a monitor drive a computer purchase decision? Look here. NEC Information Systems manufactures a full line of computers and printers and also makes the standard multisynchronous EGA monitor. The company scooped the market with multiscanning 3 years ago and maintained a technological lead long enough to become the standard. Combining the now-status-laden MultiSync II with NEC's PowerMate I Plus is a good way to sell computers.

Not that the PowerMate I Plus needs to apologize, at least not now. This computer is a dual-speed 8- and 12-MHz machine adjustable to either one or zero wait states. As such it's a fast unit without shadow RAM or memory interleaving. In default configuration the PowerMate I Plus boots at 8 MHz for peripheral compatibility and then automatically switches to 12 MHz.

NEC makes its own system board, but it uses Intel processor chips and the preferred Phoenix Technologies ROM BIOS. The setup program is on a diskette, not in ROM—a minor aggravation.

The PowerMate I Plus comes in a small box but still has room for seven expansion slots, with five free in a typical configuration. The standard serial and parallel interfaces are integrated on the motherboard, so



The NEC PowerMate I Plus is available for \$2,595 with 640K RAM. In the interest of saving space while allowing for maximum expandability, the NEC PowerMate I Plus is built to hold two drives horizontally and one vertically.



they don't need to use a slot. The front of the case is tastefully plain, with lights to indicate power-on, disk access, and 12-MHz mode.

The standard configuration has 640K of 80-nanosecond RAM, the maximum that can fit on the motherboard. You can bring the system total RAM up to 16MB with memory expansion cards, though that memory will run at only 8 MHz and require that you buy cards as well as chips.

When you buy a PowerMate I Plus, you have your choice of a 1.2MB 5¼-inch drive or a 1.44MB 3½-inch floppy drive at no extra cost. The Enhanced-style keyboard has a nice feel and comes with a particularly long, 120-inch keyboard cable (most other cords are only 72 inches long, reasonably extended).

The standard Western Digital combination floppy-and-hard-drive controller in the test configuration drives a 42MB formatted 28-millisecond hard disk drive. The test unit was an enhanced EGA system, with an NEC MultiSync II monitor. It's no trivial consideration that NEC's

monitor is the industry standard, and working in an NEC machine with an NEC controller, you have an unusually homogeneous combination. Theoretically, same-brand components shouldn't mean better performance. I didn't notice anything different, and the video speed-test results aren't spectacular, but the psychological edge of having matching brands is noteworthy.

There's room inside the case for three half-height memory devices, two mounted horizontally and one vertically. The 165-watt power supply has three device connectors. If you put in three devices and need to be able to remove media, or if you just want to look at them, removable bezels let all three devices show from the front of the computer.

With DOS 3.3 and GW-BASIC, the total test system list price of \$3,995 is a bit high, although it's in line with other imported national brands like Epson with similar equipment. However, just as with Epson, the NEC is widely discounted, if you don't mind haggling.



FACT FILE

NEC PowerMate I Plus
NEC Information Systems Inc.
1414 Massachusetts Ave.
Boston, MA 01719
(508) 264-8000

List Price: With 640K RAM, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy disk drive, DOS 3.3, \$2,595; with 42MB hard disk, EGA card and monitor, \$3,995; with 1MB RAM, VGA card and monitor, \$4,040.

In Short: The NEC PowerMate I Plus is a widely discounted 12-MHz small-box AT-type computer. Outfitted with a 42MB hard disk and the standard-bearing NEC MultiSync II monitor, this computer is a fine single-user machine. It's a bit costly and limited for future expansion, but the PowerMate I Plus will meet many users' present needs.

CIRCLE 688 ON READER SERVICE CARD

■ 12-MHZ ATs

This machine is sold by dealers throughout the country. If something goes wrong, you can take it back to a dealer or an authorized repair center, a definite advantage for those who want local area service and support. If for some strange reason it is necessary to ship a computer to the vendor for repair, the customer pays shipping one way.

NEC has an interesting DOS and ROM upgrade policy. For a fixed price of \$40, you can get new ROM chips, a new version of DOS, and new documentation whenever the set changes significantly. This aggressive and user-supportive upgrade policy is a great idea.

NEC sells a full line of computers, so this one isn't supposed to be the answer for all users. With the maximum of 640K on the motherboard and space for only three internal storage devices, you probably won't find it cost-effective to expand this machine much further than the tested configuration. As it is, the PowerMate I Plus is a functional workhorse with a great screen.

NORTHGATE COMPUTER SYSTEMS

Northgate 286/12

Speed by design: it's clear that Northgate Computer Systems values quality for the dollar with an emphasis on speed. The hardware and software components used in the Northgate 286/12 are chosen to give the most pep for the fewest dollars. While the 286/12 is not the least-expensive fully configured system in this series, it simply gives more of everything.

The 286/12 has an 8- and 12-MHz microprocessor clock switchable between zero and one wait states. Most of the expansion bus slots operate at 8 MHz, but one, a proprietary memory slot, runs at the full 12 MHz and holds up to 8MB of RAM in 1MB increments on an optional \$190 memory card. Total possible system memory is 16MB.

Northgate uses its own motherboard, an AMD (Advanced Micro Devices) processor chip, and the Award BIOS. The system configuration setup program is in ROM, where it should be for most convenient access.

Northgate doesn't believe in small computer cases. If your desk space is limited,



A top-quality machine, the Northgate 286/12 costs \$1,995 with 1MB RAM, a 67MB hard disk, and a monochrome display. In the interest of fast RAM, the Northgate 286/12 has a special speed slot for memory expansion. Using a proprietary memory card, you can add up to 8MB of extra RAM that will operate at full processor speed, avoiding the normal expansion-bus speed penalty.



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ed, you'd better look elsewhere. The company thinks that the customers it targets would rather sacrifice desk space or put the unit on the floor than give up system expansion capabilities. The solid system case includes eight expansion slots (two 8-bit and six 16-bit) and bays for up to five half-height storage devices. The 250-watt power supply includes five device connectors, enough to power a full house of compo-

nents. Northgate plans to cut back to 200 watts in the future but will continue to provide five power connectors.

The 286/12 as configured came with two serial ports and one parallel port, 1MB of 100-nanosecond RAM, an Adaptec RLL controller with one-to-one interleaving, a VEGA VGA chip set, and a 16-bit VGA multiscan monitor. Also included were a 1.2MB floppy drive with special circuitry to ensure downward read and write compatibility with 360K floppy disks, and a 67MB 28-millisecond Microscience hard disk drive.

Northgate makes a very big deal about its keyboard, which it also sells separately. During the last year or so, a lot has been written about Northgate keyboards, but a point some reviewers missed is that the design was evolving, and they weren't always talking about the same unit. The controversy stems from the keyboard feel and the inclusion and arrangement of keys. The current OmniKey/102 keyboard has

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EDITOR'S
CHOICE

FACT FILE

Northgate 286/12

Northgate Computer Systems
13895 Industrial Park Blvd., #110
Plymouth, MN 55441
(800) 548-1993
(612) 553-0111

List Price: With 1MB RAM, 67MB hard disk, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy disk drive, monochrome card and monitor, DOS 3.3, \$1,995; with VGA card and monitor, \$2,599.

In Short: Northgate bundles high-performance systems. The competitively priced 286/12 combines hardware and software components to get the most from the 12-MHz AT-level architecture.

CIRCLE 107 ON READER SERVICE CARD

the desired responsive feel and has all function keys on the left, the design I greatly prefer.

A new keyboard with the same basic design but with a few extra convenience keys is coming soon. Supposedly, Northgate intends to leave the tactile responsiveness just as it is. I hope so, and wish the company would stop changing the keyboard. Northgate's response is that reviewers keep on suggesting changes, which they then implement.

Northgate includes *VOp* and *Insta-Cache* software with this system and configures them to load automatically. *VOp* is a hard-drive optimizer that keeps files contiguous and closest to the drive-head starting position for faster access. *Insta-Cache* uses computer memory to speed subsequent disk drive calls. We tested the 286/12 with *Insta-Cache* both on and off and found significant improvement with the program active.

Included with the 286/12 system is Northgate's 1-year parts-and-labor warranty providing unlimited free telephone technical support. To cope with buyer uncertainty about the lack of on-site service, Northgate guarantees overnight shipment of replacement parts at the company's expense. Northgate includes installation instructions for all parts and will assist you over the phone at no charge. It's not on-site service, but if you don't mind opening the box yourself, you may get your machine

fixed more quickly than you would with traditional service departments; you certainly get it cheaper.

All the hardware, software, warranty, and service comes at a surprisingly low price. The list price of the tested system is \$2,599. Don't expect a discount, since Northgate sells only through the mail, but know that your purchase price gets you a big box with lots of expansion room, a relatively fast hard drive, and a very fast-and-fancy video setup.

End-user support is free, and the company has developed routines for rapid system service when needed, but it's not the same as being able to put your machine in the car and drive it to a local dealer. The effect of the service may be similar, but the feel is different.

Then again, Northgate computers aren't for just anyone. Those who need extra attention from a dealer probably wouldn't be impressed by Northgate's attempt to wring every last bit of performance possible from the 12-MHz AT computer. Northgate includes lots of software and several design features to maximize the 286/12's performance. It also does a good job of explaining what the tricks are and how to use them. If you want a system designed with performance and expansion as top priorities, consider this system seriously.

ZENITH DATA SYSTEMS

Zenith Z-248/12 Model 80

Prepare for a car metaphor. Harley-Davidson motorcycles have long cost significantly more than similarly powered Japanese bikes but have continued to sell. Porsche is regaining that marque's air of exclusivity by dropping the 924S; now the least expensive (let's not say "cheapest") Porsche is the 944, at roughly \$34,000. The automotive industry can play these games with prices because it has a heartlock on American consumers. But it just doesn't work that way with computers.

Sure, IBM and Compaq machines cost a lot, often significantly more than machines from smaller or foreign vendors. And, yes, people who buy those brands often like the status of owning expensive "American" iron. But productivity,



FACT FILE

Zenith Z-248/12 Model 80

Zenith Data Systems
100 Milwaukee Ave.
Glenview, IL 60025
(800) 842-9000

List Price: With 1MB RAM, 1.2MB 5¼-inch or 1.44MB 3½-inch floppy disk drive, DOS 3.3, Microsoft Windows/286, \$2,999; with 40MB hard disk, VGA card and monitor, \$5,498; with 72MB hard disk, \$6,498.

In Short: A pricey alternative compared with imported brands and clones, the Zenith Z-248/12 Model 80 boasts several performance-optimizing features, including a smart Superset Bus that lets expansion cards run as fast as they can, up to the full 12-MHz microprocessor speed. Many Zenith machines are sold to government, institutional, and national accounts where they are aggressively discounted from full list price.

CIRCLE 108 ON READER SERVICE CARD

though a desirable aspect, is hard to sell when the price is way out of line. Zenith Data Systems' Z-248/12 Model 80 is a well-designed, technically interesting machine, but at \$6,498 it costs too much to compete on price.

The Z-248/12 is a big box, with a dual-speed 6- and 12-MHz processor clock and zero memory wait states. In addition to shadowing ROM BIOS and video ROM, the Zenith's expansion bus runs as fast as it can whenever it can get away with it. Called the Superset Bus, it automatically drops down to a slower speed if the board cannot function at high speeds, but it doesn't penalize ones that can run faster.

With on-board firmware called Slushware, both the Zenith's ROM BIOS and video ROM are copied to RAM automatically with RAM shadowing. There is also a debugger built into ROM, a feature more important to programmers than to anyone else, but a significant boon for those who would use it.

Zenith makes its own motherboard and BIOS. The setup program resides in ROM, which facilitates system- or memory-configuration changes.

The Z-248/12 is a full-size machine with a nice fit and finish. There's room inside for six half-height devices or two full-height and two half-height drives. Four

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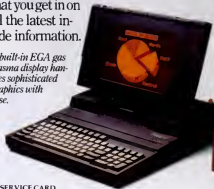
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Toshiba America, Inc., International Systems Division

■ 12-MHz ATs



The Zenith Z-284/12 Model 80 may be high-priced, but it delivers extra performance features for the money—including the Superset Bus, which lets expansion cards zoom along at speeds up to the microprocessor's 12 MHz. With 1MB RAM, the basic configuration costs \$2,999.

half-height units can show with removable-front drive covers. The 200-watt power supply has four device connectors.

Standard memory is 1MB RAM, with

cluded a 72MB 28-millisecond CDC hard drive as well as a 1.44MB floppy drive, a VEGA VGA board, and a 14-inch flat screen VGA Plus monitor.

The standard Zenith warranty covers parts and labor for 1 year on a carry-in basis. You can also buy 1- to 4-year warranty extensions.

The tested Z-284/12 list price is the highest of those tested here: \$6,498. Fully \$999 of that price is for the VGA monitor—a superb unit, but more than you might specify if you were choosing your own monitor. Of course, comparing this machine with the other units reviewed here makes its list price stand out more than it might if you compared prices with similar units from IBM or Compaq.

While Zenith certainly sells computers through dealers, a large portion of its sales are to government and educational institutions and to national accounts, where it has a reputation for very aggressive discounting on volume sales.

That doesn't do much for the individual

consumer, however, who has to consider spending \$2,000 to \$3,000 more for a unit from Zenith than for one from other vendors. These days, if you have to spend more than \$4,000 or \$5,000, you probably expect a 386-level machine, not a 12-MHz AT workhorse, even if it does come with a great screen. Price is the only problem with this well-designed performer.

ZEOS INTERNATIONAL Zeos 286/12

Looks aren't everything, especially in technical equipment, but the Zeos 286/12 is an exceptionally attractive computer. You can buy this bargain-basement machine in either a large or small case, but even in the small unit, which we tested, you get the full complement of eight expansion slots. The only trade-off with the smaller box is the limit of three internal storage devices.

The Zeos 286/12 is an 8- and 12.5-MHz zero-wait-state computer, with a constant 8-MHz expansion bus speed. The standard 512K of 80-nanosecond RAM can be expanded to 4MB on the motherboard. That's economical, since you don't need to buy extra boards, and good for performance since the motherboard memory works at full processor clock speed.



FACT FILE

Zeos 286/12

Zeos International
530 5th Avenue NW, #1000
St. Paul, MN 55112
(800) 423-5891

List Price: With 512K RAM, 1.2MB 5¼-inch or 720K 3½-inch floppy disk drive, \$995; with 1.44MB 3½-inch floppy disk drive, \$1,035; with 1MB RAM, 49MB hard disk, monochrome card and monitor, DOS 3.3, \$1,972; with EGA card and monitor, \$2,467; with VGA card and monitor, \$2,667.

In Short: The Zeos 286/12 is an inexpensive small-footprint 12.5-MHz AT compatible with a full set of eight expansion slots. Zeos provides an extensive list of options to configure this machine any way you want it and then also gives you a 30-day money-back guarantee.

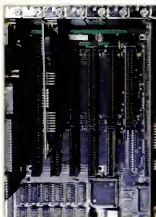
CIRCLE 66 ON READER SERVICE CARD

**Price is the only
problem with
the well-designed
Zenith Z-284/12.**

256K configured as EMS memory. Using 1-megabit SIMM chips, the motherboard slots can hold up to 6MB of RAM and are compatible with LIM 4.0 expanded memory standards.

One parallel port and two 9-pin serial ports also come standard. The test unit in-

■ 12-MHZ ATs



One of the least expensive computers in this roundup, the Zeos 286/12 offers 512K RAM for only \$995. This cleverly designed AT has a full complement of eight expansion slots in its small-sized case.



Equipped with a Suntac motherboard, an Intel microprocessor, and an Award ROM BIOS, the Zeos doesn't use memory interleaving, shadow RAM, or disk caching to enhance performance; but the 12.5-MHz clock and zero-wait-state specifications result in admirable performance overall. The high-speed RLL drive con-

troller with one-to-one interleaving helps as well.

The system setup program is on-disk, not in ROM. Zeos includes a system diagnostic program as well as drivers that configure the memory to conform to expanded, extended, EMS, EEMS, or LIM 4.0 specifications, depending on user preference.

The test configuration's small case still squeezes in eight slots, two 8-bit and six 16-bit. As tested, the computer had one 8-bit and four 16-bit slots available. The 286/12 can hold only three storage devices, with three internal half-height bays and three power-supply device connectors. The fronts of all three devices can be exposed for removable media.

One disappointing system anomaly is the turbo button on the front of the case: it does not operate in the current version of the machine.

The test computer configuration included 1MB of RAM, one parallel port and one serial port, an Adaptec floppy and RLL one-to-one interleave hard disk controller, a 1.2MB floppy drive, a Seagate 49MB 30-nanosecond hard drive, an EGA video card, and a Packard Bell EGA monitor. Including DOS this system's list price is \$2,467, but if you can settle for the same system with monochrome display, you have to lay out only \$1,972, making the Zeos 286/12 the lowest-priced full system in this roundup.

When you order, you can specify a 3½-inch 720K floppy drive instead of the standard 1.2MB 5¼-inch unit. The cost to upgrade to a 1.44MB floppy drive on the original order is \$40. Zeos sells a wide range of add-ons and will give credit if you want parts left out. There's great flexibility in configuring the machine you want.

Since Zeos isn't widely known at this time, the biggest assurance in buying one of their computers is their 30-day, no-questions-asked, money-back guarantee. As a relatively new clone vendor, Zeos International goes the extra mile to overcome buying resistance. The warranty is the standard 1-year parts-and-labor type, with the vendor paying one-way shipping, in the same mode used by the customer, if the unit is shipped back to the factory for service.

The Zeos 286/12 is a small-box AT

PC EDITOR'S CHOICE

- Austin 286/12.5
- Northgate 286/12

The two top workhorse ATs go a long way toward making the most of midrange computing. As tested, the \$2,395 Austin 286/12.5 and the \$2,599 Northgate 286/12 systems both include top-flight components in overall packages designed for value and performance.

Each answers the AT question in a different way. The Northgate system has a bigger hard drive, 16-bit VGA performance, and a larger system box. The Austin machine has a smaller box size to conserve desk space but still saves four empty slots for future system expansion by incorporating all standard components onto the motherboard.

Both the Northgate and the Austin have provisions for adding memory that can perform at full system speed: the Northgate via an optional \$199 memory card that fits in a special "speed slot" and can hold an additional 8MB, the Austin by replacing the standard 256-kilobit chips on the motherboard with 1-megabit chips to bring the total complement up to 4MB of processor-clock-speed memory. Both machines also use fast hard disk controllers and disk caching, the Austin with hardware and the Northgate through software.

clone with a full complement of expansion slots. Because Zeos offers many configuration options, it's a great chance to choose exactly what you want in a system. The performance is very good, the price is more than competitive, and the money-back guarantee is reassuring. ☐

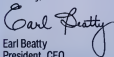
Bruce Brown, who reviewed all the machines for this article, is a frequent contributor to PC Magazine.

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OS/2 EXTENDED EDITION SYSTEM INTEGRATION THE IBM WAY

***Once it was
the name of
the game; now,
open architecture
has been left
behind in IBM's
move to roll over
the competition.
Which users stand
to benefit from
IBM's proprietary
operating system?***

What is this thing called Extended Edition? Ever since April 1987, when IBM first announced its plans for four separate versions of OS/2, Extended Edition has been the most mysterious and confusing manifestation of this new operating system.

Some people seem to welcome Extended Edition with open arms; others find it threatening. Some see it as a super-high-powered version of OS/2, while others see it as little more than a strange bundling of an operating system with a couple of application programs. At the furthest extreme, the conspiracy-minded among us have suggested that Extended Edition is the first step in making OS/2 an

■ OS/2 EXTENDED EDITION

IBM proprietary operating system.

This last interpretation is particularly troubling. The IBM PC was built under the principles of open architecture; the industry that has grown up around the IBM PC has greatly benefited from this. Customized versions of DOS have been available from a number of different hardware manufacturers, and OS/2 will be as well. But OS/2 Extended Edition will be available only from IBM. For IBM personal computers only. What is going on here?

When viewed in the context of IBM's overall product line and strategy, OS/2 Extended Edition is not mysterious or confusing or threatening at all. Extended Edition may seem like an anomaly at first, but on closer examination, it is nearly inevitable.

THE BIG PICTURE OS/2 is the operating system developed by Microsoft and IBM under the IBM/Microsoft Joint Development Agreement as a successor to DOS for 80286- and 80386-based personal computers. OS/2 uses the protected-mode operation of these microprocessors to implement multitasking (running several programs at once), a 16MB physical address space (as opposed to DOS's real-mode 1MB space, of which 640K was readily available), virtual memory (storing overflows from available memory to disk), interprocess communication, and other advanced operating-system features.

OS/2 will be available from IBM in several different shapes and forms, each containing one or more components, as shown in the diagram "The Four Flavors of OS/2." Let's begin with the Standard Edition.

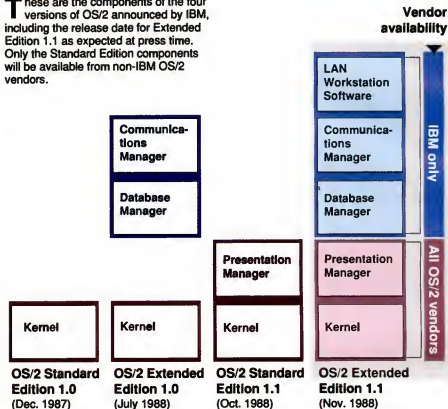
IBM's OS/2 Standard Edition 1.0, available since December 1987 for \$325, is often called the OS/2 "Kernel." The Kernel supports all the basic operating system features, such as multitasking, memory management, file input and output, character-mode video output, and keyboard and mouse input.

OS/2 Standard Edition 1.1, recently released and selling for the same price as 1.0, adds the Presentation Manager to the Kernel. For most users, this will be the most significant component of OS/2. The Presentation Manager is a graphical windowing environment that combines the user interface currently seen in *Microsoft*



The Four Flavors of OS/2

These are the components of the four versions of OS/2 announced by IBM, including the release date for Extended Edition 1.1 as expected at press time. Only the Standard Edition components will be available from non-IBM OS/2 vendors.



Windows, Version 2.0, with a sophisticated graphics programming language developed at IBM. The Presentation Manager brings the OS/2 user interface into the modern age.

Since both the OS/2 Kernel and the Presentation Manager were developed under the IBM/Microsoft Joint Development Agreement, manufacturers of PC compatibles can enter into a licensing agreement with Microsoft to configure these components of OS/2 for their own hardware and then sell this OS/2 adaptation to their customers. The versions that IBM calls "Standard Edition" are essentially the same versions of OS/2 that will be readily available from many other manufacturers of PC compatibles.

Manufacturers who sell versions of OS/2 have the freedom to include propri-

etary extensions and enhancements to the operating system. With Extended Edition, this is exactly what IBM has done: EE 1.0 is available for IBM equipment alone.

WHERE IBM STANDS OUT Although any hardware manufacturer can add its own extensions and enhancements to OS/2, it's unlikely that anyone other than IBM will come up with anything as large as Extended Edition. A product like Extended Edition makes perfect sense for IBM, but not for most other hardware manufacturers.

Why? Simple. Unlike most manufacturers of PC compatibles, IBM has its fingers in more pies than just the personal computer. IBM also sells mainframes, minicomputers, and connectivity products.

Included among the company's selection, for example, are the PC LAN and Token-Ring Network products. And with IBM's 3270 boards, PCs can emulate 3278 and 3279 terminals when connected to an IBM 370 mainframe. IBM needs OS/2 support software for these products. This support is part of Extended Edition.

IBM PCs can also use asynchronous communications and 3101 emulation to connect to a 370 mainframe or an IBM System/1 minicomputer or an information service over the telephone lines. IBM needs an OS/2 program to provide asynchronous communications support and 3101 emulation, and Extended Edition provides this.

One of IBM's most popular mainframe software products is DB2, a relational database program that is built around the Structured Query Language (SQL). Part of IBM's long-term goal is to have similar applications on all its systems. The large memory space supported by OS/2 makes it feasible to bring this powerful database technology to the PC. This, too, is part of Extended Edition.


In short, IBM is using Extended Edition as a tool to help integrate its disparate systems. Since other PC manufacturers don't have disparate systems, Extended Edition is IBM's solution for a problem that Big Blue alone faces.

It may be difficult for some users to decide whether to move from DOS to OS/2, and when. But the decision to go with OS/2 Standard Edition or OS/2 Extended Edition should be much simpler. If you need OS/2 Extended Edition, you'll know it. If you're not quite sure, you almost certainly don't need it.


EXTENDED EDITION PACKAGE

IBM's OS/2 Standard Edition 1.0 is shipped with one manual and four high-density diskettes, and it costs \$325. The update to Standard Edition 1.1 (which includes Presentation Manager) will be free.

OS/2 Extended Edition 1.0, with two manuals and eight high-density diskettes, costs \$795. The first four diskettes contain the base operating system, which is essentially the same as the version of OS/2 shipped in Standard Edition 1.0. Similarly, one of the two manuals included with Extended Edition is almost exactly the



FACT FILE



OS/2 Extended Edition 1.0
IBM Corp.
Contact your local authorized IBM dealer.
List Price: \$795 (\$675 as an upgrade from OS/2 Standard Edition)

Requires: IBM PC AT, XT Model 286, or PS/2 Model 50, 60, 70, or 80; 3MB RAM; 20MB hard disk space.

In Short: An IBM-only version of OS/2 that extends the operating system to include database and SQL support, and extends connectivity to IBM networks and mainframes.

More significant in concept than in execution, EE shows the power of dynamic link libraries and illustrates the goals of SAA.

CIRCLE 676 ON READER SERVICE CARD

same as the Standard Edition manual. As with Standard Edition, the update to Extended Edition 1.1 will be free.

The first version of Extended Edition contains the base OS/2 product plus two large systems—Communications Manager and Database Manager. Version 1.1 of Extended Edition will also include LAN Requester, which is the local-area-network software required for individual OS/2 workstations. IBM's OS/2 LAN Server software is a separate product that will cost \$995.

Both Standard Edition and Extended Edition will run on all 80286- and 80386-based IBM personal computers fitted with enough memory, including the older PC AT and XT Model 286, as well as the PS/2 Models 50 and above. IBM recommends that you have 3MB to 4MB of extended memory and 20MB hard disk space to install and run Extended Edition, not counting room for applications.

TWO MANAGERS The Database Manager and Communications Manager are copied to the hard disk during installation of Extended Edition and appear on the OS/2 Program Selector. Both programs have a user interface based on menus and fill-in panels.

The Database Manager is a full-fledged relational database program built around

SQL, as is DB2; IBM claims that Database Manager includes about 95% of the functionality of its mainframe predecessor. As with most database programs, you can define tables, add or change data via entry screens, define queries, and define and print reports. You don't need to know SQL to use Database Manager, but you can use SQL for generating queries and reports. (See the sidebar "Database Manager: A User's Perspective.")

The Communications Manager is an all-purpose communications program that supports 3270 emulation using one of IBM's 3270 boards, as well as VT-100 or 3101 emulation using asynchronous communications. It supports several popular modems including the Hayes Smartmodem 1200 and 2400 and the IBM modems. Network support will be added to the Communications Manager in Extended Edition 1.1.

Neither of these programs is very impressive. They are slow and clunky, and the user interface is often confusing. The Communications Manager is very weak and lacks features now considered essential to communications, such as a script language. But in one sense, the quality of these programs doesn't matter. What matters is what IBM has put beneath these programs.

THE DLL DIFFERENCE Ordinarily, a program and the operating system are viewed as distinct entities. The operating system provides services such as file I/O and memory management for programs that run under it, and a program makes calls to the operating system through its application program interface (API).

At first it may seem that Extended Edition is little more than a couple of OS/2 programs bundled with the base operating system. Although you can certainly treat Extended Edition accordingly, the programs have been constructed in a way that renders them ultimately more powerful and useful than mere programs.

The key is that both the Database Manager and the Communications Manager consist of executable files (the programs themselves) and dynamic link libraries (DLLs). The latter are very important to the overall architecture of OS/2, and to Extended Edition as well.

DATABASE MANAGER: A USER'S PERSPECTIVE

Since the announcement of Extended Edition, much of the ballyhoo over it has concerned one of its long-awaited components: the Database Manager, which sports full-fledged relational database capabilities and Structured Query Language (SQL). Providing strong support for OS/2 applications, Database Manager consists of two subcomponents: Database Services and Query Manager. The former is a "database engine," a program that accepts SQL commands as its input and retrieves the requested data.

Using Database Services to process SQL-based queries, Query Manager prompts you with menus through the process of creating, defining, modifying, and querying. It prompts for each element of a query: the table name, columns, sort order, and conditions for including or omitting rows in the result. The menus construct an SQL statement (displayed on another screen) that's executed by the database engine, and if you're at all familiar with SQL it's easy to visualize the statements as they're being built.

Unfortunately, the menus prohibit the use of complex queries or subqueries, and they won't let you define a derived table from a query result. While the SQL code produced by Query Manager is fairly safe (the code is always efficient since only simple queries are allowed), you'll have to avoid multitable queries until you acquire a working knowledge of SQL. A screen is available for issuing SQL com-

mands directly to Query Manager, so it could be used as an SQL tutor, albeit an expensive one.

EMBEDDED VS. DYNAMIC SQL

Query Manager doesn't do any data retrieval or manipulation directly: it issues an SQL command to Database Services to do the job. Other application programs can do precisely the same via dynamic or embedded SQL.

Dynamic SQL comprises commands issued by a program (at the user's request) when the program is run. Embedded SQL consists of commands that are included in the program's source code language (in this case, C) and made available to Database Services when the program is compiled. Extended Edition's dynamic link libraries (DLLs) are used to make the connection between the program and the database engine.

What advantage does this offer? First, dynamic and embedded SQL allow a nonprogrammer to develop database commands for reports and queries independently of application development. Second, since dynamic and embedded SQL commands are executed by the database engine, a program does not need to manipulate the database directly. And if the database definition changes, the database engine can make the appropriate adjustments. Thus, the application program is kept independent of structural changes to the database, and is relieved of having to navigate or modify the database directly. This concept is

known as *data independence*.

A more detailed discussion of relational database concepts was presented in "SQL: An Emerging Database Standard for PCs" (*PC Magazine*, May 17, 1988), which argued that data independence—the ability to hide the underlying data storage mechanism from users and applications—is the great benefit bestowed by relational databases. Thus, with dynamic and embedded SQL, a relational database user need not be concerned with the *how* of data retrieval, only with *what* data is being retrieved.

MEASURING UP While at first glance Extended Edition's Database Manager looks impressive, the long-term benefits won't be found in Query Manager: it's too weak and constricting. Indeed, the interfaces of other microcomputer DBMSs, such as *Paradox*, are far more robust. While you don't need to know SQL to utilize Query Manager, you'll be productive far sooner if you do.

Database Manager's real punch is its OS/2 application support via embedded or dynamic SQL, for corporate *dBASE* pundits have long yearned to write compiled database applications in a *real* high-level language. So, while it remains to be seen whether C plus SQL will be a viable combination, this is the solution that Extended Edition's Database Manager offers OS/2 users. —Richard Hale Shaw

Richard Hale Shaw is a contributing editor of PC Magazine.

OS/2 is an extensible operating system because programs can make function calls not only to the operating system, but to any dynamic link libraries that are added to it. These dynamic link libraries—files with the extension .DLL—contain various functions and routines that OS/2 programs can call. When you run a program under OS/2, the operating system determines what dynamic link libraries the program needs, loads them into memory, and links the calls from the program to the functions

in the DLL. This process is called dynamic linking.

Dynamic link libraries play a dual role in OS/2. In one sense, a DLL can be viewed as an extension of a program. A programmer, for instance, may decide to use a DLL to store some common routines that are used by a closely related group of programs. Using a DLL for these routines saves disk space and memory space.

But dynamic link libraries can also be viewed as extensions of the operating sys-

tem. All you need to do is copy a DLL to a hard disk on which OS/2 is installed, and you've essentially added a whole new set of functions defined in the DLL.

Much of the base OS/2 product, after all, is a collection of dynamic link libraries that provide entry points to operating system functions. Both the Database Manager and the Communications Manager add DLLs to OS/2, and the additional API supported by the Presentation Manager is implemented with still more of them.

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Simple Reports

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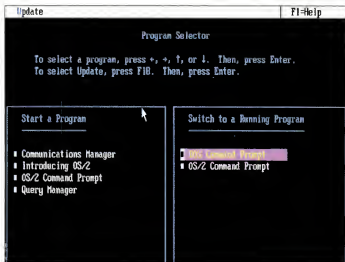
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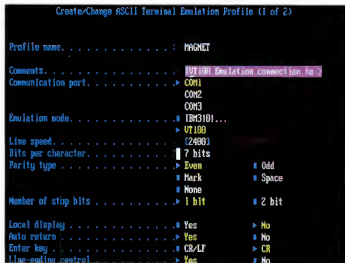
InfoWorld, 12/28/87.

THE MANY FACES OF EXTENDED EDITION

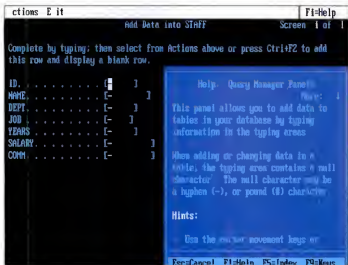
OS/2's basic features of multitasking and memory management are complemented by Extended Edition's proprietary add-ons. Here's a look at aspects old and new.



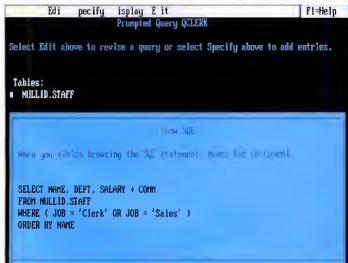
After you have installed Extended Edition, the OS/2 program selector displays the new programs; to run a program, you select it with the keyboard or mouse. The Standard Edition works exactly the same way.



This Communications Manager screen lets you define communications parameters for ASCII terminal emulation. Each set of parameters is identified by a profile name.



Context-sensitive help in Extended Edition is available at any time by pressing F1. One standard of the SAA Common User Access interface is specifying the help command in the upper-right corner of the screen.



After you define a query through menus, the Database Manager lets you view the Structured Query Language code generated to perform the query. This feature can help you learn SQL.



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■ OS/2 EXTENDED EDITION

THE EXTENDED EDITION API How can you tell whether a DLL is being used as an extension of a program or an extension of the operating system? Perhaps the real difference is that DLLs that extend the operating system are documented.

IBM has published several technical reference manuals that document the additional API provided by the Extended Edition DLLs. The *ACDI Programming Reference* manual, for example, discusses the Extended Edition's Asynchronous Communications Device Interface. Although OS/2 Standard Edition has a software interface to the serial ports, the ACDI interface adds support for several popular modems, and for auto-dialing and auto-answering.

The *Database Manager Programming Guide and Reference* manual describes the Database Manager API, which allows you to write C programs with embedded SQL code and calls to the Database Manager DLL. These programs are run through a utility (included with Extended Edition) that converts the SQL code to C. The programs are then compiled normally.

This means that third-party software manufacturers can write and sell programs that run under Extended Edition and use these DLLs. Programmers can write their own specialized Extended Edition programs for specific business and office applications. In the long run, the most important aspect of OS/2 Extended Edition may actually be the API rather than the IBM-developed programs.

Obviously, the API included in Extended Edition goes far beyond anything we've come to expect from personal computer operating systems. But the support of dynamic linking in OS/2 makes such extensions of the operating system very easy.

IBM'S MASTER PLAN It's almost impossible to discuss anything IBM does these days without also discussing Systems Application Architecture (SAA), IBM's master plan. First announced in March 1987, SAA is so far-reaching that it seems everything IBM has done since that date somehow fits into it.

SAA is a set of software standards, separated into four main areas. Using IBM's terms (which I will translate into English shortly), they are

- Common User Access,
- Common Programming Interface,
- Common Communications Support, and
- Common Applications.

These standards are for software developed on the entire range of IBM machines: the personal computers, the minicomputers, and the mainframes. IBM intends for SAA to provide some coherence and consistency to the wide range of products the company has developed over the years and will develop in the future. The standards are published by IBM so that other software manufacturers can follow them if they wish.

How does Extended Edition fit into SAA? Profoundly. For OS/2, particularly Extended Edition and the Presentation Manager, is an SAA showcase.

The first part of SAA, Common User Access (CUA), is a set of standards providing what most of us would call a "consistent user interface." This consistency across IBM applications and machines is intended to lessen user training time.

The CUA interface is implemented in the Presentation Manager and likewise in the two programs in Extended Edition. While the user interface is not exactly the same (primarily because the Presentation Manager runs in graphics mode while the Database Manager and Communications Manager currently run in character mode), they are similar enough to be recognizable. That the actual user interface in Extended Edition is disorganized and confusing is beside the point; the principles are sound.

The next part of SAA, the Common Programming Interface (CPI), is intended to allow programs written in several high-level languages to be ported to all of IBM's machines. SQL, which is supported by the Database Manager, is part of CPI, as is the graphics programming language in the OS/2 Presentation Manager.

The Common Communications Support (CCS) involves the various data streams, protocols, and communications links that can be used to link various IBM machines. The Communications Manager fits into SAA by supporting many of these standards.

And the Common Applications area reveals IBM's intentions to develop common applications across its entire line of

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■ OS/2 EXTENDED EDITION

computers. Programs very much like those found in Extended Edition, perhaps, will be ported to other IBM machines.

TOTAL SOLUTION IBM has always attempted to provide a "total solution" for its customers. It's easy to see how Extended Edition fits into that concept and how it relates to the goals of SAA. As I said at the outset, Extended Edition represents a nearly inevitable direction for IBM.

Yet we may still feel a little uneasy about Extended Edition. In one sense, Extended Edition truly is an IBM proprietary operating system that locks out the compatible market. No one can guarantee that OS/2 Extended Edition will run on an IBM clone; each manufacturer who sells OS/2 must reconfigure those parts that directly access hardware so that it will run on the specific machines.

The situation doesn't have to be this way. The Database Manager, for instance, does nothing that is dependent on the machine hardware. The program and its dynamic link libraries make standard OS/2 Kernel function calls. If IBM sold Database Manager as a separate product, it would obviously run on all machines that run OS/2.

The Communications Manager presents stickier problems. This program supports IBM's Token-Ring adapters and 3270 boards, and its maker obviously won't guarantee that these boards can be installed in a compatible. Yet IBM doesn't show any interest in supplying information so that other manufacturers can adapt the Communications Manager DLLs for their own hardware. To do this would allow the creation of programs that could use any 3270 board through these DLLs, rather than just IBM's own.

Obviously Extended Edition makes the most sense in an all-IBM shop. For companies that have installed an IBM network or purchased IBM 3270 boards to connect IBM PCs to IBM mainframes, the road to OS/2 is through Extended Edition rather than Standard Edition. But while Extended Edition may be part of a total solution for IBM's customers, it's not much of a solution for the rest of the PC marketplace. ☐

Charles Petzold is a contributing editor of PC Magazine.

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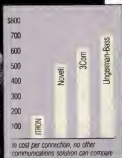
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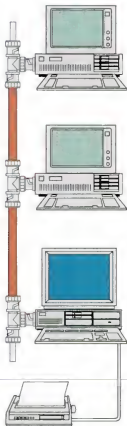
BUILDING WORKGROUP SOLUTIONS:

ETHERNET CARDS

Economical high-speed transmission and a broad base of support are key to this cabling scheme's resiliency in the marketplace. These 13 products pose a viable network choice.

Ethernet has reached the 15th anniversary of its invention, and after 15 years the network cabling and signaling scheme is still a respected standard. The reason for Ethernet's longevity is simple: the scheme provides high-speed transmission at an economical price, offering a broad base of support for a variety of LAN and micro-to-mainframe applications. After being on the market for nearly 9 years, it boasts a large installed base and is still a wise network choice.

These days you can buy an adapter card to plug your PC into an Ethernet-plan network for as low as



■ ETHERNET ADAPTER CARDS

\$295; 13 adapter cards designed to work with coax-cable Ethernet networks are reviewed here. Since most of them are made from the same chip set, you'll find them quite similar. Some of them, however, are better for plugging into a server than into a PC workstation. And there are other important differences when it comes to features, performance, and cost.

DEFINITIVE ETHERNET People often associate the term Ethernet with network elements beyond the scope encompassed by the cabling and signaling scheme coined by Robert Metcalfe and David Boggs at Xerox's Palo Alto Research Center (PARC). According to Metcalfe, the source of the Ethernet name is "the luminiferous ether thought to pervade all of space for the propagation of light" (a.k.a. electromagnetic waves).

In clearer terms, Ethernet is a specification that describes a method for computers and data systems to connect and to share cabling. Ethernet encompasses what are called the Physical and Data Link layers of data communications by the International Standards Organization, the standard-setting body for data communications. (For background information, see "Networking Acronyms and Buzzwords," *PC Magazine*, June 14, 1988.)

The primary characteristics of the Physical Ethernet Link include a data rate of 10 megabits per second, a maximum station separation of 2.8 kilometers, a shielded coaxial cable connecting the stations, and a specific kind of electrical signaling on the cable called Manchester-encoded digital baseband. The latter specification describes the electrical signals that make up the digital zeros and ones that are constant-

ly passing over the network.

The major part of the Data Link layer specification for Ethernet describes the way stations share access to coaxial cable through a process called Carrier Sense Multiple Access with Collision Detection (CSMA/CD). CSMA/CD is an operational scheme that modern standards committees call a media access control (MAC) protocol. The media is the coaxial cable connecting the network nodes, and the access control protocol determines how nodes on the network share access to the cable.

ETHERNET THE PERENNIAL For many years Ethernet was the fastest-growing network system and the first choice of many data managers and system integrators. But many people now buying networks choose IBM's Token-Ring cabling and media-sharing plan instead. Token-Ring performs well, and IBM continually dangles new ways to connect PC and mainframe computers through Token-Ring as bait to prospective buyers.

Token-Ring installations, however, are very expensive compared with those of Ethernet, and there are efficient ways to connect to IBM, DEC, Hewlett-Packard, Xerox, and many other computer systems over Ethernet. (For a longer discussion of the differences between Ethernet and IBM's Token-Ring, see "Making Connections: 3Com's Ethernet and Token-Ring," *PC Magazine*, April 14, 1987.)

As befitting a network scheme with its tenure, Ethernet has had many offspring. AT&T's StarLAN is an 1Mb-per-second adaptation of Ethernet to twisted-pair telephone wire. Ethernet adapters using fiber optic cable are available from Codenoll Technologies and DCA 10Net Communications. The latest growth area is in Ethernet adapters operating over twisted-pair telephone wire at data rates of 10Mb per second. In this review, however, we confine ourselves to network adapter cards devised for installations using the older Ethernet cabling schemes for coaxial cable.

The coax-cable scheme found most often in installations of PC-based networks uses a thin, 52-ohm coaxial cable between each network station. This cable, commonly called thin Ethernet, is typically limited to 305 meters (1,000 feet) between

A GLOSSARY OF ETHERNET TERMS

Address A unique memory location. Network interface cards often use shared memory address locations to move data from the card to the PC's processor.

Base address The first address in a series of addresses in memory, often used to describe the beginning of a network interface card's I/O space.

BNC Connector A small coaxial connector with a half-twist locking shell.

Boot ROM A read-only memory chip allowing the workstation to communicate with the file server and to read a DOS boot program from the server. Stations can operate on the network without having a disk drive.

Cheapernet See *thin Ethernet*.

CSMA/CD Carrier Sense Multiple Access with Collision Detection: the scheme for sharing the wiring among many nodes used in Ethernet.

Driver A software program that interfaces between portions of the LAN software and the hardware on the network interface card.

802.3 The IEEE committee specification that is nearly identical to Ethernet.

Impedance An electrical property of a cable, measured in ohms.

IRQ Interrupt request: a computer in-

struction that interrupts a program for an I/O task. Often executed through specifically channeled electrical circuits.

Jam signal A signal generated by a card to ensure that other cards know that a packet collision has taken place.

Jumper A plastic-and-metal shorting bar that slides over two or more electrical contacts to set certain conditions.

N-connector The large-diameter connector used with thick Ethernet cable.

T-connector A coaxial connector, shaped like a T, that connects two thin Ethernet cables while supplying an additional connection for a network interface card.

Terminator A resistor used at both ends of an Ethernet cable to ensure that signals do not reflect back and cause errors. Usually attached to an electrical ground at one end.

Thick Ethernet A cabling system using large-diameter, relatively stiff cable to connect transceivers. The transceivers connect to the nodes through flexible multiwire cable.

Thin Ethernet A cabling system using a thin and flexible coaxial cable to connect each node to the next node in line (also called *Cheapernet*).

repeaters, although an Institute of Electrical and Electronic Engineers (IEEE) specification limits it to 600 feet. The network interface cards in each station usually attach to this cable through a T-connector,

which makes it easy to connect and disconnect stations from the network without breaking the continuity of the cable.

More frequently found in installations with larger computers is the oldest Ether-

net cabling scheme. This scheme uses heavily shielded coaxial cable (informally named "frozen yellow garden hose," which aptly describes its size, color, and ease of installation) that serves as a back-

PACKAGING AND MOVING DATA: THE ETHERNET WAY

Ethernet uses a communications concept called datagrams to get messages across the network. The CSMA/CD media access technique makes sure that two datagrams aren't sent out at the same time and serves as a method of arbitration if they are.

Ethernet's datagram concept makes a simple claim: that a communicating node will make its best effort to get a message across. The datagram concept, however, cannot guarantee that a message will arrive at any specific time or that it will be free of errors or duplications; it does not even guarantee that delivery will occur. If you want any of these assurances, you have to implement them in higher-level software.

The messages sent as datagrams on Ethernet take the form of self-contained packets of information. These packets have fields containing information about their destination and origin and the sort of data they contain, not to mention the data itself. Because the data field in each packet can be no larger than 1,500 bytes, large messages must traverse the network in multiple packets. (Articles statistically

describing the efficiency of packet transmission systems have been the favorite filler of professional journals since Bob Metcalfe published his Harvard Ph.D. thesis, "Packet Communications," in 1973.)

You may notice that one element of the packet structure in the illustration is different from that codified by the IEEE 802.3 committee. The 802.3 committee saw a need for a user ID in the packet. Their specification trades the byte count field for a user ID field. Fortunately, the network interface cards don't care. They take their data from higher-level software that sets up the packets. Ethernet and 802.3 packets can traverse the same network, but nodes operating under one packet format can't exchange data with nodes designed for the other format without software translation taking place at some level.

LISTEN BEFORE YOU TRANSMIT

Before packets can traverse the coaxial cable of the Ethernet network as datagrams, they must deal with CSMA/CD, the media access protocol that deter-

mines how nodes on the network share access to the cable.

CSMA/CD works in a listen-before-transmit mode: if the network adapter receives data to send from higher-level software, it checks to see if any other station is broadcasting on the cable. Only when the cable is clear does the network adapter broadcast its message.

CSMA/CD also mediates when the inevitable happens: when two or more nodes simultaneously start to transmit on an idle cable and the transmissions collide. The adapters can detect such collisions because of the higher electrical-signal level that simultaneous transmissions produce. When they detect a collision, the network adapter cards begin transmitting what is called a jam signal to ensure that all the conflicting nodes notice the collision. Then each adapter stops transmitting and goes to its internal programming to determine a randomly selected time for retransmission.

This "back-off" period ensures that the stations don't continue to send out colliding signals every time the cable grows quiet.—Frank J. Derfler, Jr.



The Ethernet Packet



In the Ethernet protocol, messages are sent between workstation nodes in the form of "packets," or frames. Each packet measures 72 to 1,526 bytes long and contains six fields, five of which are of fixed length. The preamble field allows the receiving station to synchronize with the transmitted message. The destination and

source address fields contain the network ID of the nodes receiving and initiating the message. The type field indicates the type of data in the data field, and the data field contains the actual data. The CRC field helps the receiving node perform a cyclical redundancy check—an error-checking analysis of the total packet.



Benchmark Tests: Ethernet Adapter Cards

Admittedly, not all of the network configurations we used to test the adapter cards are equal. The cards with 16-bit addressing and on-board processing are in a different league (and price range) from those with 8-bit addressing. To test server driver software and workstation driver software separately, the optimal test network had boards with 16-bit addressing in its server, with 8-bit boards on the workstations. But not all of the companies providing cards for us make both 8-bit and 16-bit cards; of those that do, only 3Com supplied us with both.

As a result, we were forced to set up the rest of the networks with the same (8-bit or 16-bit) boards in the workstations as in the server. The networks made up of 8-bit cards, therefore, may appear inordinately slow. In actual installations, we recommend using a 16-bit card in the server, even if you choose cards from another vendor for the workstations.

Besides the bit-addressing size, we found that two factors significantly affect performance: the amount of buffer memory and the driver software design. The amount of buffer memory on the network interface cards should affect performance, because with larger memory-storage space the card does not have to wait for

the computer to empty the buffer before accepting a new packet. The driver software (provided by the vendors of the Ethernet cards or, in some cases, by Novell) determines how the drivers handle the data; how they interface with their host computers is an important factor in performance. Nevertheless, because of the interaction of several factors—buffer size, driver software, and data bus size—it is not possible to pinpoint the effect of one factor in any specific case.

Though Ethernet's data transmission speed is rated at 10 megabits per second, research by Digital Equipment Corp. and other companies shows that even heavily used networks with multiple servers do not average over a megabit per second of throughput. The factors that limit effective throughput on a PC-based LAN include the data transfer rate of the server's hard disk—and of the computer's data bus—and the efficiency of the networking software. For this review, all these factors remained the same, as we were trying to flush out differences among the Ethernet cards themselves; hence the absence of our Hard Disk Access Load and Database Load benchmark tests. Were we to test server-based functions such as software response, the results would simply vary with the performance of the cards.

Network Throughput Under Load

(Results given in kilobits per second)

	Zero stations	One station	Two stations	Three stations	Four stations
Tiara LanCard E (8-bit)	608	590	593	582	570
G/Ethernet AT (16-bit)	614	608	587	590	562
IMC Networks PCnic (16-bit)	611	548	534	514	500
Ether Card Plus (8-bit)	546	527	495	472	444
Localnet D-Link (8-bit)	561	520	456	450	420
3C503 EtherLink II (8-bit) and 3C505 EtherLink Plus (16-bit)	518	497	467	435	402
Acer 5220 (8-bit)	495	467	451	416	387
Earthnet-1e (8-bit)	499	460	425	398	380
Univation LifeLink (8-bit)	522	481	450	412	380
DTK Ethernet LAN Card (8-bit)	493	467	426	396	367
AST-Ethernet Adapter (16-bit)	536	476	445	404	360
Novell NE1000 (8-bit)	497	478	438	396	355

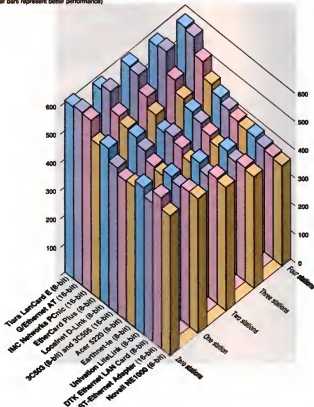
The Network Throughput Under Load benchmark test reports the throughput recorded during the performance of a standardized task on the network. To obtain the figures shown here, we run a test program performing a sequential create, a sequential read, a sequential write, a random read, and a random write of a large file. The record sizes used in these activities systematically rotate among 16K, 4K, and 512 bytes. The results shown represent the average throughput over a period of time sufficiently long to ensure consistency. Usually a 1MB file is used, but this size may be adjusted for unusually fast or slow networks.

While the timed test is run, we load the network with other special programs. The Network Throughput Under Load test sequence puts a heavy load on the network interface (cards, media, and access protocols) while placing a minimal load on the hard disk and file server software. In this test, each load station continuously reads and writes its own 1-byte data file, changing the data each time. This creates a high volume of data packets and strong contention at the network interface level.

For the Ethernet adapter cards, tests were run using an 80386-based Compaq 386/20 as the Novell server. The workstations were 80286-based Dell 200 computers running with 12-MHz CPU and 8.33-MHz data bus speeds. All tests were run using the same server, workstations, and thin Ethernet cabling, and results are reported in terms of throughput measured in kilobits per second.

Network Throughput Under Load

(Taller bars represent better performance)



Throughput: The Better Yardstick

If you are familiar with *PC Magazine's* LAN benchmark tests, you may notice a change in the way the results are represented. In the past, test results were usually reported in terms of the number of seconds required for a system outfitted with a particular product to carry out each task. Starting with this issue, however, our LAN test results will be expressed in terms of throughput: the rate of speed, normally in bits or kilobits per second, at which data is transmitted during operation of a PC-based LAN. Throughput has become an industry-standard measure of product performance, as reflected in several of our previous test reports for LAN gateways, modems, and other equipment.

bone among the clusters of nodes scattered around a building. The maximum length of this cable between repeaters is 500 meters (1,640 feet), and the cable attaches to devices called transceivers, which transform the cable's connections into something more suitable for a PC or terminal. A flexible transceiver cable made up of a shielded twisted-pair wire runs between the transceiver and the network node. Transceiver cables can be up to 15 meters (45 feet) long; they connect to the network card through a 15-pin D-connector.

HOW FAST DOES IT GO? The fact that Ethernet's 10-megabit-per-second data rate specification is much faster than IBM's Token-Ring specification (4Mb per second) and ARCnet's (2Mb per second) can be misleading because these speeds describe the transmission rate over the cable. What these ratings fail to reflect are the factors that limit effective throughput on a PC-based LAN—things like the data transfer rate of a hard disk drive, the transfer rate of the computer's data bus, and the efficiency of the networking software.

For this reason, we've found it difficult ever to get five to seven fast PCs to generate more than a megabyte per second of network data combined in the PC LAN Labs benchmark tests, even under the most artificial conditions. The fact is, the networks themselves sit idle most of the time while the hard disk, the operating system software, the server software, and the computer data bus handle the data coming and going. Ethernet was designed to handle "bursty" traffic, and that is exactly what it gets in real-world PC-based LANs.

More on the tests: in order to share access to the coax Ethernet cable effectively, Ethernet adapter cards must follow the aforementioned CSMA/CD protocol (see the sidebar "Packaging and Moving Data: the Ethernet Way" for a description of how the protocol works). The "back-off" algorithm generated by CSMA/CD in the event of packet collisions can have an effect on benchmark tests because if a node is involved in a packet collision, it will defer to other nodes until there are no more collisions within a given time period.

What this means is that any node might "sit out" several collision resolution cycles. For this reason, if the benchmark test

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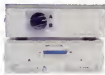
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■ ETHERNET ADAPTER CARDS

period is too short, the performance of an adapter that sends out packets that are involved in collisions will look bad. Our benchmark test charts thus show the averaged results of repeated runs.

CARD CHIP SETS All Ethernet cards on the market are designed using chip sets containing the basics of the Ethernet protocols. At present, the majority of the cards use the set created by National Semiconductor Corp., although some use Intel's. (Western Digital has announced that it will market an Ethernet chip set early in 1989, a move which should further reduce the already declining price of the network interface cards.)

The Ethernet adapter cards available from different manufacturers differ in the way they use the semiconductor manufacturer's chip set and in the features the designers add. Companies design different implementations to improve performance and incorporate value-added features. Because of the similarity among the products of many vendors, we primarily looked for anything that a company does to differentiate its cards from those of the competition; the reviews, therefore, are short.

These interface cards typically contain 8K of RAM that buffers the network data. Some vendors, like Gateway Communications, put 16K or more of RAM on the cards to improve the handling of data and prevent dropped packets. Similarly, some companies put a 16-bit-wide data path on the card to improve flow between the card and the computer data bus. RAM added to network cards can also store portions of program code, thereby freeing working RAM in the computer.

The addition of a microprocessor from the 80186 family to the network interface card reduces the amount of work the processor in the host computer must do to implement network communications. These cards are typically used in servers that carry a heavy data load because they're expensive and can do the greatest good in the server.

One option that's become almost a standard feature among card manufacturers is an open socket for a remote boot ROM. This special ROM forces the host station to take its operating system boot from the server and is useful in some types

of LAN installations, such as those with diskless workstations. Other usability features include LEDs that indicate operational status, DIP switches that make it easy to change the card configuration, and different kinds of connectors.

DRIVING THE CARDS On the cable side of the network, these adapter cards are interchangeable. Adapters from 3Com will happily exchange packets over a shared cable with an adapter from Earth or any of the other vendors. They all conform to the same electrical signaling, physical connection, and media-access specifications.

But things are very different on the software side of the card. Each vendor designed and implemented the adapter using slightly different hardware components. Those components require customized

■ Our performance tests are as much a test of the *NetWare* driver software as they are of the hardware on the cards.

software in order to address them and to move data through the system; this level of software is typically known as the driver software. The performance of the software that interfaces the cards with the *NetWare* network operating system can also make a difference.

We intended to test these cards under both Novell's *NetWare* and under IBM's PC LAN software. We quickly discovered, however, that while almost every vendor chose to develop drivers for Novell's *NetWare*, few companies have developed the custom implementations of NetBIOS required to run PC LAN.

There are several reasons for this, and they have as much to do with the impending release of Microsoft's *LAN Manager* as they do with the high popularity of *NetWare*. Under *LAN Manager*, Microsoft will furnish almost all of the code that

companies need to develop NetBIOS drivers for their cards. Hardware designers will write only a small (perhaps 2K bytes) block of code for final interfacing. In short, many companies are simply waiting for *LAN Manager* before they furnish NetBIOS drivers for their cards.

Since *NetWare* drivers are popular and plentiful, we tested the cards only under *NetWare*. But keep in mind that our performance tests are therefore as much a test of the *NetWare* driver software supplied by the vendor as they are of the hardware on the cards. The quality of the code in the driver can have a significant impact on the throughput of the card.

The 13 adapter cards for coaxial Ethernet networks that we've reviewed come from 12 vendors: Acer Technologies Corp., AST Research, Datatech Enterprises (DTK), Earth Computer Technologies, Gateway Communications, IMC Networks Corp., Localnet Communications, Novell, 3Com Corp., Tiara Computer Systems, Univision, and Western Digital. Excelan also markets a network adapter card, but it arrived too late for this review. Some cards emulate Novell's own Ethernet cards, and we were able to use these cards under the same driver without regenerating the system. Other cards have unique drivers and forced us to regenerate the operating system to link in the new drivers.

You can mix Ethernet cards from different vendors in any network you install and operate. You can put a card augmented with a microprocessor and using a 16-bit-wide data path in the server for high efficiency and mix lower-cost cards from different vendors throughout the workstations. But you must generate the appropriate driver for each type of card and install it in the node using that card. Mixing drivers between nodes is a potential administrative headache, but if you configure the different adapters carefully, this setup can save you money and let you easily expand your network.

ACER TECHNOLOGIES CORP.

Acer 5220

A half-size Ethernet card, the Acer 5220 is designed specifically for operation under Novell's *NetWare*. Acer supplies its own

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■ ETHERNET ADAPTER CARDS

drivers for NetWare, but it doesn't supply NetBIOS or other drivers. The card makes use of an 8-bit address bus and an 8K packet buffer. All selections of IRQ and I/O parameters are made with slide-on jumpers, and a diagnostic program is included in the package.

The Acer 5220 yielded middle-of-the-pack performance on our benchmark tests. At \$329 each, however, it features a price lower than those of most of its competitors. This card is a good choice for workstations on any Novell-based LAN.

AST RESEARCH AST-Ethernet Adapter

The AST-Ethernet Adapter cards are big: we had to remove the card guides at the end of the expansion slots to get these cards into our machines.

Though large, AST's card is flexible and expandable. It has connections for the 16-bit-wide AT bus and allows you to select the AT's high-numbered IRQ lines (10, 11, 12, and 15) to resolve IRQ conflicts with other I/O devices. The board comes with 16K of RAM, and you can upgrade it in 16K increments to 64K using static RAM chip sets. (This RAM upgrade is usually required only for a card operating in a very active server.)

Instead of forcing you to puzzle over jumpers or DIP switches if you want to change the factory-configured settings, AST supplies a software program called Smart Switch. Not only does Smart Switch display information about your options, but it also makes configuration suggestions—telling you, for example, how to put up to four AST-Ethernet cards in the same machine.

AST includes a very good installation manual. The troubleshooting section contains suggestions on how to respond to 16 commonly encountered error messages. The maintenance section includes some good hints, though each suggestion almost always mentions making sure that the card is properly inserted and the cables are connected.

At \$595 the AST-Ethernet Adapter cards are at the high end of the Ethernet card marketplace. They are aimed strictly at the Novell marketplace; AST does not supply drivers for NetBIOS or other LAN

operating systems. But if you're looking for a good card to put into a server, or if you have a network of AST Premium PCs, the AST cards are strong contenders. (If you use this card in an AST Premium/286, you should set a parameter that allows it to use special hardware in the AST Premium to run without wait states.)

DATATECH ENTERPRISES CO. LTD. DTK Ethernet LAN Card

The Ethernet LAN card offering from Datatech Enterprises Co. (DTK) is a low-priced alternative to the cards with 8-bit address buses marketed by Novell and 3Com. For \$295, DTK gives you a functional 8-bit, half-length card using the National Semiconductor Ethernet chip set.

The DTK card is populated by jumpers and DIP switches. The DIP switches are handy for setting the IRQ line and parameters like the addresses of the base memory I/O and the remote-boot ROM. The jumpers set the DMA and I/O addresses, and a row of eight individual slide jumpers selects between thick and thin Ethernet connectors. Manipulating eight sliders is more of a chore than changing the one jumper block that other cards use, but you will probably never touch these jumpers.

The DTK card had one of the lowest throughput figures, but the overall difference between the fastest and slowest cards would not be noticed in any but the most critical of applications.

EARTH COMPUTER TECHNOLOGIES Earthnet-Ie

Hearing someone say, "You have a call from Earth," makes you look around and say, "Huh? Where am I?" But Earth Computer Technologies is right on terra firma with an Ethernet card and other LAN products offered at reasonable prices with some unique features.

The \$395 Earthnet-Ie fits into a short card slot in a PC XT or AT and has an 8-bit data bus interface. The card uses the National Semiconductor Ethernet chip set with 8K of RAM for a data buffer. Under Novell's NetWare, the Earthnet-Ie cards



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FACT FILE

Acer 5220

Acer Technologies Corp.
401 Chaucer Ave.
San Jose, CA 95131
(408) 922-0333
List Price: \$329

Requires: XT, AT, or PS/2 compatible.
In Short: A competitive Ethernet card at an aggressive price. Primarily for use in workstations.

CIRCLE #68 ON READER SERVICE CARD

AST-Ethernet Adapter

AST Research
2121 Alton Ave.
Irvine, CA 92714
(714) 863-1333
List Price: \$395

Requires: XT, AT, or PS/2 compatible.
In Short: A great card for Novell servers and very busy workstations. Features full 16-bit addressing and RAM expandable to 64K.

CIRCLE #61 ON READER SERVICE CARD

DTK Ethernet LAN Card

Datatech Enterprises Co. Ltd.
15711 East Valley Blvd.
City of Industry, CA 91744
(818) 333-7533
List Price: \$295

Requires: XT, AT, or PS/2 compatible.
In Short: A card with 8-bit addressing and a low price tag that supplies full Ethernet functionality.

CIRCLE #60 ON READER SERVICE CARD

Earthnet-Ie

Earth Computer Technologies
10525 Lawson River Ave.
Fountain Valley, CA 92728
(714) 964-5784
List Price: \$395

Requires: XT, AT, or PS/2 compatible.
In Short: This card fits into a short slot and is special because of its dual coaxial connectors and LEDs.

CIRCLE #69 ON READER SERVICE CARD

emulate Novell's own Ethernet cards and are installed using Novell's standard software drivers.

What sets the Earthnet-Ie apart from other network adapter cards is its unique use of connectors, its switches, and (our favorite feature) its diagnostic LEDs.

Each Earthnet-Ie card has two BNC connectors for the 52-ohm "Cheapernet" connection. Using these, you don't have to use coaxial-cable T-connectors with the Earthnet-Ie card (although you can). The advantage of the two-connector setup is that the cables are neater and easier to install. T-connectors spread the cables out horizontally on the back of the PC and are hard to install if the PC is crowded with video adapter, I/O, and power cables. Also, the T-connector places a heavy mechanical load on the card's connector, and this can cause failures.

But you see the drawback of dual-connector systems when you want to move a PC. With a T-connector system, you simply detach the T-connector from the back of the PC; the network stays intact. If you use the dual connectors of the Earthnet-Ie and want to move the PC, you must reconnect the cables through a T- or barrel connector to keep the LAN continuity. The advantage of the Earth Computer Technologies card is that it lets you decide when it makes sense to use a T-connector or a direct connection.

The designers of this card included a DIP switch to set the memory addresses of the boot ROM and the card's I/O port. Other vendors typically employ slide jumpers for this purpose. The DIP switch is nice, though these addresses aren't something you change often (if ever) after installation.

The feature we really like on the Earthnet-Ie card is its diagnostic LEDs. Two LEDs, visible on the back of the card, flash to indicate cable and card activity. These simple diodes let you trace problems immediately to the cable connections, software, or the card. This inexpensive feature is valuable when you need it.

Earth Computer Technologies sells a NetBIOS software module for the Earthnet-Ie card, but instead of including it with the card as some vendors do, Earth charges \$250 for the software and an unlimited network license.

GATEWAY COMMUNICATIONS INC. G/Ethernet AT

Gateway is one of the more experienced PC-based LAN companies. Its line of products includes SNA and X.25 gateways, as well as its own version of Novell's *NerWare*. In addition to the G/Ethernet AT card we tested, Gateway sells Ethernet cards for IBM PC bus and IBM Micro Channel architecture systems.

Gateway advertises that its interface card has high performance. Our benchmark tests support its claims: the card

■ Our benchmark tests support Gateway's claim of the G/Ethernet AT's high performance.

topped our list of contenders. The \$525 G/Ethernet AT has a 16-bit data interface, but it can be used in the 8-bit slots of standard PCs. Because Gateway's focus is on marketing *NerWare*-compatible products, the company does not currently offer a NetBIOS module.

The Gateway card comes with 64K of RAM to accelerate data handling through the PC bus. Though other cards typically offer only four options, you can address this board at any of eight different memory I/O locations. It also lets you optionally select interrupts 5 and 7, which are available on AT-type computers. The flexible memory addresses and interrupt selection can help you when you install a card in a machine crowded with other I/O devices.

When you buy a G/Ethernet card setup for Novell's *NerWare*, you typically don't have to reconfigure it. The network interface card designed for the server is so well integrated with *NerWare* that it includes its own Novell copy-protection key card. This saves the server expansion slot normally occupied by the Novell key card.

Because Gateway markets its own version of *NerWare*, it has an excellent technical support program. The documentation it



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columnist, PC Magazine

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Thank You.



CIRCLE 504 ON READER SERVICE CARD

■ ETHERNET ADAPTER CARDS

supplies with its Ethernet cards is very complete and includes a lot of practical information on installing Ethernet cabling systems.

IMC NETWORKS CORP.

IMC Networks PCnic

IMC Networks Corp. is a new company staffed largely by people with long experience in the PC LAN marketplace. The company's initial products are the PCnic (PC Network Interface Card) line of LAN adapters for Micro Channel and PC bus computers.

The IMC card for the PC bus occupies about three-fourths the length of the expansion slot and has a 16-bit AT-type connector. IMC markets two versions of the card: one for workstations and one for servers. The \$395 card designed for workstations has 16K of RAM on-board; the

■ Because of the PCnic cards' performance, price, and overall operation, they should be high on any Ethernet buyer's shopping list.

\$425 server card carries 64K. The Micro Channel version of each card sells for the same price. Novell drivers, but not NetBIOS interfaces, are supplied with each card.

The unique feature of the PCnic card is its ability to use different kinds of cabling. Besides the 52-ohm coax specified for thin Ethernet, the IMC card can use the RG-62 coaxial cable installed for IBM 3270 networks, as well as RG-59 cable. In installations that would otherwise require rewiring, this feature could save a considerable amount of money.

On the version of the board we tested, settings for the I/O address and interrupt line can be made using both software and hardware. The company is developing a

board that eliminates the jumpers entirely, allowing you to make any desired changes through software.

The PCnic cards performed very well in our benchmark tests. They are also priced well. Because of their performance, price, flexibility, and operation in both Micro Channel and AT-bus machines, the PCnic cards should be high on any Ethernet buyer's shopping list.

LOCALNET COMMUNICATIONS INC.

Localnet D-Link

The D-Link card marketed by Localnet is a classic short Ethernet card. Priced a few dollars below those of most of its competitors, it yields solid operation.

This board is a classic because of its size and the use of several slide jumpers that set everything from the IRQ line to the type of cable connector. The proper positions for these jumpers are nicely illustrated in the manual—but don't ever lose that manual.

The card carries the National Semiconductor Ethernet chip set on a short-length circuit board with an 8-bit interface into the PC's data bus. Besides containing an 8K RAM buffer, the board has a socket for a remote-boot ROM through which the client station can get a DOS image from the file server without using a local disk drive.

This network interface card has one unique feature: an optional on-board thin Ethernet cable terminator. Instead of having to use a coaxial-cable T-connector and a "silver bullet" terminating resistor at each end of the cable run, you can enable the on-board terminator and attach the cable directly into the card. This feature saves you a few dollars per network and prevents a hunt for lost connectors, but the trade-off is that you must always use the card with the terminator enabled as the last card on either end of the cable run. If you move the machines, you will have to open them up, remove the cards, and change the sliders.

Localnet prices these cards at \$369; a version for the Micro Channel architecture is available for \$495. Either the Novell driver program or NetBIOS costs \$95 with a license for the entire network. A separate TCP/IP driver suite is available for \$400.

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G/Ethernet 16-bit
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G/Ethernet Micro Channel adapter

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CIRCLE 146 ON READER SERVICE CARD

PCM266



EDITOR'S
CHOICE

FACT FILE

G/Ethernet AT

Gateway Communications Inc.

2941 Alton Ave.

Irvine, CA 92714

(800) 367-6555

(714) 553-1555

List Price: \$525

Requires: XT, AT, or PS/2 compatible.

In Short: High performance and excellent NetWare compatibility are the hallmarks of these cards.

CIRCLE 888 ON READER SERVICE CARD

IMC Networks PCnic

IMC Networks Corp.

1342 Bell Ave., Unit 3E

Tustin, CA 92680

(714) 259-1020

List Price: PCnic AT/XT/PC card for client workstation operation, \$395; PCnic II Micro Channel card for client workstation operation, \$395; PCnic for AT server operation, \$425; PCnic II Micro Channel for AT server operation, \$425.

Requires: XT, AT, or PS/2 compatible.

In Short: A high-performance family of cards able to use cable other than standard thin Ethernet.

CIRCLE 887 ON READER SERVICE CARD

Localnet D-Link

Localnet Communications Inc.

3303 South Harbor Blvd., Suite E-8

Costa Mesa, CA 92626

(714) 549-7942

List Price: D-Link Ethernet card, \$369; Micro Channel version, \$495; Novell software drivers, \$95 with a network license; NetBIOS drivers, \$95 with a network license; TCP/IP drivers, \$400 with a network license.

Requires: XT, AT, or PS/2 compatible.

In Short: A classic half-size card with options for remote boot ROM and on-board cable termination.

CIRCLE 886 ON READER SERVICE CARD

Novell NE1000

Novell Inc.

122 East 1700

South Provo, UT 84061

(801) 379-7660

List Price: NE1000, \$395; NP600, \$895.

Requires: XT, AT, or PS/2 compatible.

In Short: One of the "classic" PC Ethernet cards. Delivers full functionality on an 8-bit address bus.

CIRCLE 886 ON READER SERVICE CARD

NOVELL INC.

Novell NE1000

The Novell NE1000 is one of the classic cards against which all others are compared. This \$395 card uses a National Semiconductor chip set and comes with an 8-bit address bus and 8K of on-board memory. Novell sells remote-boot ROMs for this card that give the client workstation the ability to get a DOS boot image from the server without using a local disk drive.

The Novell card uses jumpers to make the I/O address, DMA, and IRQ selections; of course, drivers for the NE1000 are included in every copy of *NetWare*. Not surprisingly, Novell has not seen the need to supply NetBIOS drivers for the card. NetBIOS, and other protocols like TCP/IP, are supplied either through emulation or through gateways in the *NetWare* architecture.

Novell markets an \$895 16-bit version of this card, the NP600, that would normally be used in servers. We did not receive an NP600 for evaluation, so the benchmark tests were run using the less capable NE1000 in the server; certainly, the throughput results under heavier load would have been better if we'd had the 16-bit card in its place. The Novell Micro Channel card, the NE2, should be available by the time this article goes to press.

3COM CORP.

3C503 EtherLink II 3C505 EtherLink Plus

There is certainly a place reserved in the computer hall of fame for 3Com's 3C501 EtherLink card. Over half a million of these boards have been shipped; they form the backbone of thousands of Ethernet networks. They have also been the foundation of our testing efforts in the *PC Magazine* LAN Labs for several years.

Purists frequently chided 3Com because the 3C501 has a small buffer and has been shown to drop packets in very busy environments. We have always been a little skeptical of this criticism, for the cards have worked well in every stressful situation we have put them in. But mindful of the need to keep leading the market, 3Com released the \$445 3C503 EtherLink II with an 8K buffer in response to this criticism.

We didn't see much practical difference between the throughput times of the new EtherLink II and the older EtherLink cards, even when six 12-MHz workstations generated as many minimum-size packets as possible for nearly an hour.

3Com's solution for really busy nodes is the \$895 3C505 EtherLink Plus, which we used in the server in our benchmark tests. This card contains its own 80188 microprocessor and up to 256K of memory. The 16-bit-wide address bus of the 3C505 lets it move data quickly. In fact, the 3Com cards' success in the benchmark tests is due in no small part to the 3C505 card's presence in the server.

These network interface cards are widely supported by third-party vendors. At least two software packages for doing network analysis, as well as several drivers for TCP/IP and OSI protocol stacks, are designed for them.

A good indication of the power of the 3Com interface cards in the market is that even though 3Com does not offer the drivers for Novell's *NetWare*, Novell found the 3Com 3C503 board important enough for it to supply the drivers on its own. We downloaded them from Novell's NetWare service on CompuServe.

TIARA COMPUTER SYSTEMS INC.

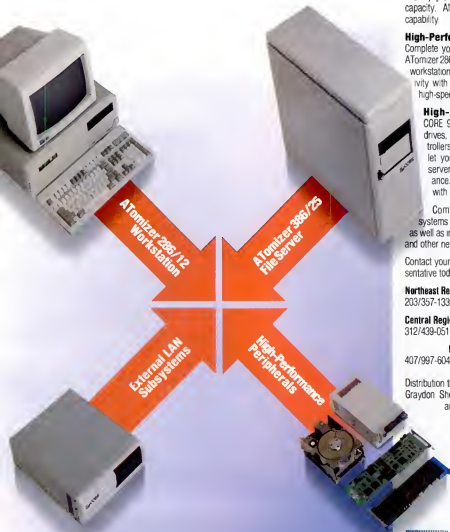
Tiara LanCard E

The Tiara LanCard E is a clone of Novell's 8-bit NE1000 Ethernet card. You can use the Tiara card interchangeably with Novell's card, retaining the drivers that Novell supplies for the NE1000 to drive the LanCard E. Tiara supplies its own driver set as well, but though its drivers take up a tiny bit less space in the workstation than Novell's driver set, they are a little less flexible.

For example, if you want to change the I/O address in the Tiara drivers, you must use DEBUG to change some bytes in the code. The procedure is well documented, but it could prove daunting to inexperienced installers. Having to perform it might be an irritant for those who know that the installation options could have been made more easily available.

Tiara has several products under development that will round out its product line. A company spokesperson claims that the

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■ ETHERNET ADAPTER CARDS

company will soon deliver NetBIOS and TCP/IP drivers for the LanCard E. It is also creating cards for the 16-bit AT bus and for the Micro Channel architecture bus. These new cards will use the Fujitsu MB 86950 Ethernet chip set.

UNIVATION INC.

Univation LifeLink

Univation markets LifeLink Ethernet cards primarily to support its LifeNet operating system. But the company recognizes the market dominance of Novell's NetWare and includes NetWare drivers on a diskette with every card.

The LifeLink card is one of the few using the Intel Ethernet chip set. The card uses an 8-bit address bus and slide jumpers to set the IRQ, I/O memory address, and other parameters. Univation puts 16K of RAM on the card for buffering. This \$395 card fits into any half-size expansion slot.

The company makes NetBIOS and TCP/IP drivers available. NetBIOS drivers are priced at \$100 per node; two different TCP/IP implementations, one basic and one enhanced, are available at \$225 and \$395 per node respectively.

These cards are a competitive alternative to similar Novell and 3Com cards.



EDITOR'S CHOICE

• G/Ethernet AT

When you integrate the network cards from one vendor with the operating system from another, you always face the possibility of problems: it's better to get as much support as possible from one vendor. For this reason, if you want to run Ethernet cards under NetWare and you want top performance, the Gateway G/Ethernet cards are the clear choice. Gateway resells NetWare, and the company's technical support people know the details of both NetWare and Ethernet. These cards also have great performance and reasonable pricing.



FACT FILE

Tetra LanCard E

Tetra Computer Systems Inc.
2700 Garcia Ave.
Mountain View, CA 94043
(415) 965-1700

List Price: 8-bit address bus, \$395; 16-bit address bus, \$675.

Requires: XT, AT, or PS/2 compatible.

In Short: A clone of the Novell NE1000 but with an optional Novell driver.

CIRCLE 653 ON READER SERVICE CARD

3Com Corp.

3165 Kifer Rd.
Santa Clara, CA 95052
(800) NET3COM
(800) 638-3266

3C505 EtherLink II

List Price: \$445

Requires: XT, AT, or PS/2 compatible.

CIRCLE 632 ON READER SERVICE CARD

3C505 EtherLink Plus

List Price: \$895

Requires: XT, AT, or PS/2 compatible.

In Short: Built under the stewardship of the inventor of Ethernet, these high-performing cards join a family of industry standards.

CIRCLE 654 ON READER SERVICE CARD

Univation LifeLink

Univation Inc.
638 Gibraltar Ct.
Milpitas, CA 95035
(408) 263-1200

List Price: Univation LifeLink, \$395; NetBIOS, \$100 per node; TCP/IP basic, \$225 per node; TCP/IP Enhanced, \$395 per node.

Requires: XT, AT, or PS/2 compatible.

In Short: In terms of both performance and price, a competitive alternative to the industry-standard cards from Novell and 3Com.

CIRCLE 652 ON READER SERVICE CARD

EtherCard Plus

Western Digital
2445 McCabe Way
Irvine, CA 92714
(714) 863-0102

List Price: EtherCard Plus, \$399; enhanced version (WD803EBT), \$399; EtherCard Plus, \$449; EtherCard Plus, \$499.

Requires: XT, AT, or PS/2 compatible.

In Short: Though they lack unique technical features, these cards boast a large base of support and a wide variety of available drivers.

CIRCLE 651 ON READER SERVICE CARD

WESTERN DIGITAL

EtherCard Plus

Western Digital makes the best-looking circuit boards that anybody puts into electronic equipment: its boards are always well laid out and nicely finished. But then, you'd expect that from a company that is also a leading supplier of chips.

The Western Digital EtherCard Plus product line consists of one Micro Channel architecture card and two slightly different 8-bit PC-bus cards. The EtherCard Plus takes up slightly less than half an expansion slot. This card carries only 8K of RAM and does not have a boot ROM socket. The card we tested, the enhanced version, takes up fully half the expansion slot, carries 32K of RAM, and has a boot ROM socket.

These cards have slide jumpers and are otherwise unremarkable for the technical features they have. Western Digital did put LEDs on some of its earlier cards to show network activity, but that nice touch didn't carry over to the newer cards.

A major advantage of Western Digital's line is the drivers loaded on the diskette sold with each card. The WD "Superdisk" contains drivers not only for Novell but also for 3Com's 3+Share, DECnet-DOS, Sun PC-NFS, UNIX Version 3, and NetBIOS. Additionally, other companies marketing utilities like LAN analyzers and higher-level protocol sets like TCP/IP often target them specifically at Western Digital cards. These programs ensure that the Western Digital cards will be at home in literally any network setting.

The Western Digital EtherCard Plus cards performed well, and their pricing is realistic. If you want a good product with good support and flexibility, from a vendor with an excellent reputation, then Western Digital's cards are what you want. By the time this article is published, Western Digital will also be marketing its version of the SynOptics LattisNet card (see "Making Connections: Fast Performance over Telephone Wire," PC Magazine, September 13, 1988). This card affords 10MB-per-second links over twisted-pair wire.

Frank J. Derfler, Jr., is workgroup systems editor of PC Magazine.

Mother Nature Can Teach Us A Lot About Hard Disks.

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- 80286 Processor Operating at 12MHz with Zero Wait States delivering 16MHz Effective Throughput
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Options:

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Mono		\$1381	\$1485	\$1594
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Mono	\$695	\$770	\$964	\$990	\$1107	
RGB	\$879	\$954	\$1148	\$1174	\$1291	
EGA	\$1089	\$1164	\$1358	\$1384	\$1501	

PC BRAND 386/20 \$2100



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1024K, 1.2MB or 1.44MB Drive, 101-Key Board

Standard System Features:

- Intel 80386 Processor Operating at 20MHz with Zero Wait States in interleave mode delivering 30MHz Effective Throughput
- 1024K RAM standard expandable to 16MB via 32Bit RAM boards using 256K and/or 1MB 100ns RAM chips
- 1.2MB 5.25" or 1.44MB 3.5" Diskette Drive
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ARCHIVES IN MINIATURE



A CD-ROM disk looks for all the world like a plain old compact disk—so much so that you might accidentally “play” it in your diskman, with potentially disastrous results to your loudspeakers. And a CD-ROM drive is so remarkably similar to your home CD player that many can play audio CDs with potentially musical results.

The simple difference is that the spiral of “pits” and “lands” on a CD-ROM disk, read by reflected laser light and translated to digital bits, encodes not music but information—precisely the same kind of data you find on a

A CD-ROM's ability to cram 660MB onto a single disk heralds new ways of delivering and manipulating information. PC Magazine examines the technology's promise—and eight broad-based products you can buy today.

■ CD-ROM LIBRARIES

floppy or hard disk. The CD-ROM's raison d'être is sheer capacity: a single disk can hold up to 660MB of data (though keeping it down to a paltry 550MB may avoid certain technical problems). That's the equivalent of more than 1,900 old-style 360K floppies, 475 new-model 1.4MB jobs, or 17 garden-variety 40MB hard disks. Unlike most floppy and hard disks, the CD-ROM is read-only, hence the ROM (read-only memory) moniker; unlike most hard disks, it's removable from the player.

If predictions were gospel, CD-ROM couldn't miss. At Microsoft's third annual CD-ROM conference early in 1988, company chairman and CEO Bill Gates forecast that by Christmas 1991, the typical \$1,000 PC will come equipped with a CD-ROM drive. Link Resources, a New York research firm specializing in electronic media, predicts that there will be a total user base of 1.3 million CD-ROM players by the end of 1992—and an industry amounting to \$2.5 billion (about half of it in royalty payments to information owners).

Current reality, however, is less stunning. Link Resources estimates a total installed base of 85,000 CD-ROM players at the end of 1988 and predicts a total of 220,000 for year-end 1989; other industry observers consider these figures a tad optimistic, as most forecasts have traditionally been during the 3 years of CD-ROM's existence. Clearly there's no "breakthrough" software title so far: the best seller may have accounted for 3,000 copies over 3 years, and products that have broken into five-digit figures are exceptions.

Still, unlike some exotic schemes you may have heard about, CD-ROM isn't pie in the sky. The concept is 5 years old; the hardware has been available for 3; and disks crammed with gigabytes and gigabytes of information are on the shelves. In this, *PC Magazine's* first major CD-ROM survey, we review the software with the broadest appeal: products from Grolier Electronic Publishing, H.W. Wilson, NEC, McGraw-Hill, Microsoft, Tri Star Publishing, and Ziff Communications Co. A future article will focus on hardware.

THE UP SIDE Speak with any CD-ROM guru and you're likely to walk away feeling ashamed that you don't have your



CD-ROM: The Evolution of a Technology

The CD-ROM format was co-designed by the multibillion-dollar electronics concern N. V. Philips of the Netherlands and Japan's Sony Corp. In 1979, after 3 years of intensive research. By March 1980, 12 proposals already existed for a compact disk specification that could guide further product development. Sony and Philips collaborated on what is now commonly called the "Red Book," released in early 1982; it quickly became the standard for digital audio disks.

After this initial breakthrough came a period of steady progress. Philips and Sony understood that information, too, could be stored on compact disks. With computer-deciphered coded tracks, the CD could be a vast warehouse for the storage, retrieval, and distribution of information. The result of this research was the "Yellow Book" of guidelines for CD-ROM data storage, which appeared in late 1983. The next step was to develop standards compatible with the Yellow Book specification; not all PCs could read all CD-ROM disks, and not every disk would work on every player.

Despite these obstacles, the industry showed further signs of maturation. Grolier Electronic Publishing released the first mass-market CD-ROM disk, *The Electronic Encyclopedia*, in January 1986. And at the first International Conference on CD-ROM in February 1986, Philips and Sony announced CD-I (compact disk-interactive), also known as the "Green Book" specification. This self-contained interactive medium would remain a consumer product and would not require a computer.

More-recent variations on CD-ROM technology include Philips, Sony, and Microsoft's CD-ROM XA, and GE and RCA's DVI (see the sidebar "CD-ROM and VUI: Loretta Swit vs. the A- Prompt"), but CD-ROM's true advances are said to be erasable and write-once technologies. This past April, Sony announced its first WORM (write-once, read-mostly) optical drive. And Philips's CD plans include a "Blue Book" outlining a CD-PROM (programmable read-only memory) or write-once disk, and another specification describing a CD-EPROM (erasable programmable read-only memory). Philips is now calling its WORM system Write-Once; availability is expected sometime this year.—Robert Nisonoff

Robert Nisonoff is an editorial assistant of *PC Magazine*.



■ CD-ROM LIBRARIES

The primary physical difference between a CD-ROM reader and a CD player is audio output: the ROM reader traditionally lacks the analog audio circuits incorporated into the player. But despite this missing function, CD-ROM readers have a much higher price tag to offset the expense of developing computer interface boards and driver software. To ease the complaints over this disparity, some CD-ROM manufacturers are now including audio jacks and CD player emulation software. A front-panel jack like the one on the Philips CM121 reader (top) requires only a set of headphones to hear your favorite audio CD—and, of course, your computer's running the emulation software. The JVC XL-V330 audio CD player (bottom) was offered at a \$320 list price; the Philips CD-ROM drive was \$895.



player yet. The astonishing information density of a 4 $\frac{3}{4}$ -inch (12-cm) diameter disk creates major advantages even in the simple areas of size and weight. As Linda Helverson, publisher of *The CD-ROM Sourcebook*, has pointed out, a single 550MB CD-ROM can store the equivalent of 270,000 pages of text—which would typically weigh more than 2,800 pounds, occupy more than 110 feet of shelf space, and take more than 20 days to transmit at 2,400 bits per second.

The benefits of sheer information density are far from insignificant if you intend to move the information by mail—or simply need to keep it handy. Lawyers have noticed that storing an office law library on CD-ROM could cut space needs and save on rent. The U.S. Navy and Air Force have become highly interested participants in CD-ROM development, if only to compress the vast manuals they must keep at hand. Hewlett-Packard, which seems to be buying into CD-ROM technology in a big way, now offers its complete Unix documentation (12,000-odd pages!) on a single disk.

CD-ROM offers stability. Since it's a read-only medium, you can't accidentally format a disk or eliminate data from it (though judicious application of solvents or abrasives will render data unreadable).

Since the data is protected by tough polycarbonate plastic and read by a laser that never touches the surface of the disk, it's immune to head crashes or magnetic anomalies. Since the disk is portable, you can remove it from the player and store it

■ **Speak with any CD-ROM guru and you're likely to feel ashamed that you don't have your player yet.**

The information density creates major advantages.

under lock and key wherever you prefer. And until huge, cheap erasable media come along, the major piracy problem is the larcenous soul who decides to stroll out the door with 500 expensive megabytes of data in a shirt pocket.

And CD-ROMs can be replicated cheaply. Creating one can be a bit pricey

(the major outlays are for retrieval software licenses and data preparation, but mastering fees themselves can now be as low as \$2,500). Once the disk is mastered, any CD plant can churn out copies for about two bucks apiece. On a cost-per-byte basis, that's by far the cheapest delivery system available.

THE FLIP SIDE So with all that going for it, why isn't there a CD-ROM player on your desk? Why do industry predictions continue to outstrip reality by a substantial margin?

For openers, there's the price of entry: Since the introduction of CD-ROM, the cost of players has been slow to drop, in large measure because of the weak dollar (all CD-ROM players are made overseas), in part because of small production runs—and in part, say many observers, because of oligopoly.

Hardware manufacturers claim that CD-ROM players require greater manufacturing precision than ultracheap CD audio players can offer. CD-ROM players do include extra error correction circuitry, as well as an interface card to link up with the computer. But an examination of these all-but-empty half-slot cards and a cursory glance at the machines indicates that there's plenty of profit in the boxes. The

■ CD-ROM LIBRARIES

limited number of manufacturers—Hitachi, Philips, and Sony hold most of the market share—clearly tends to limit competition and prevent the unseemly price wars that slashed profits in the CD-audio battlefield. Today a typical drive lists for about \$995 and sells for about \$700 (even lower in some hardware/software package deals); Steve Sieck of Link Resources sees the list price getting down to the \$400 range by the end of 1992. By comparison, your local cut-rate electronics outlet will sell you a CD audio player for less than \$200.

Price would probably be less of a problem were the disks erasable; a 600MB disk would be a godsend if only for backup purposes. But when a device is limited to playing back "prerecorded" software, it may be stigmatized as an interim solution. The inability to update a CD-ROM means that the information on it must not be terribly time-sensitive; though some CD-ROM subscription plans include periodic updates on floppies or on-line, those methods can be cumbersome. For in-house use, WORM optical drives (see "The Worm Turns," *PC Magazine*, March 29, 1988) or the forthcoming magneto-optical erasables (which recently gained fame via their inclusion in Steve Jobs's NeXT machine) are often a wiser choice.

The situation is comparable to the introduction of video disks. Despite their inherent technical superiority, they were trounced by the advent of the VCR, which let the user create a personal video collection for the cost of blank tape. A CD-ROM version of Tandy's announced THOR CD (or a similar CD-compatible erasable format possibly waiting in the wings) could instantly render today's read-only players obsolete—and at the same time broaden the market for CD-ROM. No one expects this to happen soon.

Standards, once a problem, are quickly firming up. The Philips/Sony "Yellow Book" of October 1983 laid down rules for physically storing data on CD-ROM but omitted any mention of a logical structure for the data: files, directories, etc. In the earliest days of CD-ROM, virtually every disk used its own proprietary format and came with software that could read it. The High Sierra conference held in November 1985 developed a standard logical

A CD-ROM HARDWARE PRIMER

Once you decide to join the small crowd of CD-ROM users, the rest is easy. First, you get a drive. Since performance specs are similar, limited by the CD-ROM format (for example, goosing up access times by spinning the disk faster is verboten), the drives are differentiated mainly by features and price. The major considerations:

■ Do you want an inboard or outboard model? Inboard units generally fit into a half-height floppy disk drive bay. Outboard units may be designed to sit under your monitor or simply house an internal-style drive in a box. Space is the major consideration.

■ Do you want a proprietary or SCSI interface unit? If you've already got an SCSI card or are thinking about another SCSI device, you'll save a slot and a bit of cash by going SCSI, and you should later be able to hook the drive to a Macintosh if need be.

A proprietary interface will take up a slot in your PC but won't go into a Mac. Finding one for the Micro Channel may take some doing; to avoid bus-hogging, an SCSI interface may be the best way to go, anyway.

■ Do you want a drive with audio outputs? Some CD-ROM players (technically known to almost no one as "Option A Drives") can read CD-audio disks—and make it easy to listen to them by including a miniphone jack on the front and/or RCA aux-level stereo jacks on the back. The nicest of these players have a front-panel volume control knob for the headphones. All other CD-audio functions are performed by software, which may be supplied with your drive; if not, check out *CD-Play* (see *After Hours*, *PC Magazine*, September 13, 1988). No current model offers a front panel or re-

mote control for CD-audio.

If you're your own boss, you may want the option of listening to soothing music when you're not using the drive for research purposes; if you're someone else's boss, you may want to keep temptation out of your Megadeth-bedazzled employee's way.

■ Do you want a drive that uses a "caddy"? Some units let you open a drawer and slap a disk into the drive. Others (including most of the half-heights) require you to insert the disk into a small case called a "caddy" before putting it into the machine. Using the caddy can be an annoying extra step; worse, naive users may shove disks into such machines without the caddy, producing potential service nightmares. Some users, however, prefer to buy extra "caddies" and store CD-ROMs in them permanently, safe from potentially troublesome dust and fingerprints.

Once you've got the drive, installing it is generally a matter of plugging a card into an expansion slot, connecting a cable, and putting the unit where it belongs. Watch out for port address conflicts; with certain systems, you may have to move a switch on the unit or a jumper on the card and possibly change a parameter in the CD-ROM extensions as well.

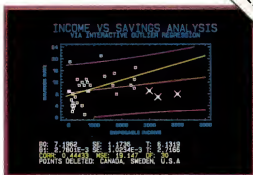
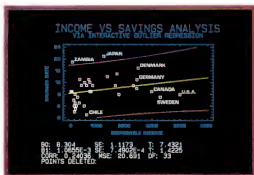
After that, edit CONFIG.SYS to include a DEVICE= reference to the proper .SYS file (check the manual or README file for the proper syntax; it differs slightly from drive to drive). Then edit AUTOEXEC.BAT to invoke MSCDEX.EXE (again, syntax is critical, and if you use a lot of TSR software, you may have to experiment with loading order). Slap a disk in the drive, and half a gigabyte of pure information will be at your fingertips.—Stephen Manes

format, which Microsoft's original CD-ROM extensions, introduced in 1987, could read. The more recent ISO (International Standards Organization) 9660 format, based on High Sierra but with slight differences, has been slower to gain accep-

tance, in part because of the large installed base of machines that do not yet have the revised MS-DOS CD-ROM extensions that will read such discs (see the sidebar "Microsoft CD-ROM Extensions: CD-ROM as Just Another Disk Drive").

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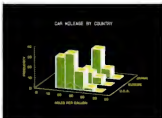
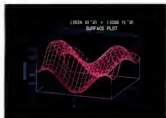
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MICROSOFT CD-ROM EXTENSIONS: CD-ROM AS JUST ANOTHER DISK DRIVE

The major standard for accessing CD-ROM devices from DOS is the Microsoft MS-DOS CD-ROM extensions (MSCDEX). Microsoft's original version worked only with High Sierra-format disks; the recently released Version 2.0 can read late-model ISO 9660-format disks as well.

To get the extensions running, you use CONFIG.SYS to invoke a 2K to 8K .SYS file specific to your drive. The extensions are in a program called MSCDEX.EXE that you'll generally invoke via AUTOEXEC.BAT; it remains resident and eats another 28K of RAM. By using the proper parameters, you can install as many CD-ROM drives as you have drive letters left. After that, you can access your CD-ROM drive precisely as you would any other—except that it's read-only. CHKDSK the drive, and

you'll learn that you "Cannot CHKDSK a Network Drive." Do a DIR, and you're likely to see many megabytes of storage but "0 bytes free"—a convention that Microsoft adopted under the theory that even though there may well be free bytes on the disk, there's not a blessed thing you can do with them.

To network CD-ROM drives, you'll need more than just the extensions. On-line Computer Systems (20251 Century Blvd., Germantown, MD 20874) offers software called *Opti-Net* that lets you access CD-ROM drives over most NetBIOS-compatible systems. Price varies depending on the number of users involved; acquiring site licenses for the CD-ROM software is up to you.

You can't buy the CD-ROM extensions directly from Microsoft; like the various versions of MS-DOS, they're li-

censed by and available from hardware manufacturers and selected vendors. If you've got the old version of the extensions, contact the vendor of your drive for an upgrade. Good luck.

Some bad news: at this writing, the CD-ROM extensions don't work with OS/2 (not even in the Compatibility Box), a real shame for OS/2 developers who might otherwise clutch *Programmer's Library* to their bosoms. In fact, there's no OS/2 support whatsoever for CD-ROM drives, though Microsoft promises it will arrive one of these days.

More bad news: the CD-ROM extensions don't work with DOS 4.0, either. And if you want to use them with *Microsoft Windows*, you'll have to install your program as an old (full-screen) application. What was that about "compatibility," anyway?—**Stephen Manes**

Disk performance is another potential difficulty. CD-ROM uses the same disk-spinning mechanism found in a standard CD player—a mechanism originally intended for digitized music, reading one bit after another sequentially and only rarely performing random accesses. Result: the average access time of a CD-ROM player can range from 400 ms. to 1,000 ms. (a full second!)—between 20 and 50 times slower than a typical hard disk. But once the head is properly positioned, it can read and transfer data at a respectable 150K per second—still only about a fourth the rate of a typical hard disk, but roughly five times faster than a floppy. One important aspect of data preparation for CD-ROM is therefore to store the information on the disk in a way that minimizes time-consuming seeks and maximizes sequential reads.

Individual CD-ROMs are simply too small for many applications. When it comes to mass storage, "large" numbers begin to look tiny in a hurry: the 10MB PC-XT hard disk is Exhibit A. In practice, the CD-ROM's stated 660MB capacity may shrink by one-third to one-half if the

data is indexed extensively—as it generally must be to maximize performance. And that "whopping" 660MB shrinks still further in the world of color bit-mapped graphics, where a single 640 by 480 by 16-color bit-mapped image requires more than half a megabyte of storage.

The storage limitations are being attacked via hardware (multidisk "jukeboxes" and/or networked drives) and by software (data compression and/or multidisk databases). A combination of both methods is likely to be in the cards as CD-ROM matures. The DVI standard, for example (see the sidebar "CD-ROM and VUI: Loreta Swit vs. the A> Prompt"), directly addresses the software compression issue—with some spectacular results—but is still a long way from becoming a part of the average user's hardware arsenal.

WHAT'S OUT THERE Publicly available CD-ROM software at the moment is primarily a repackaging of large quantities of data that's available in other formats, print or on-line. Much of it is data in the public domain, supplied by the govern-

ment, and is therefore free from royalty fees. But value is added by the convenience of the CD-ROM medium itself and by software—mapping software, for example, that allows you to hook in to massive demographic databases, or a program that can quickly show you the titles of all 72 books published by Stephen King between January and March 1986.

The variety of information available on CD-ROM keeps growing by quantum leaps. The library market has been quickest to embrace CD-ROM technology (and owns the greatest number of CD-ROM players), and it has been rewarded with the most titles. Still, a quick browse through *The CD-ROM Sourcebook* (\$525 from DDRI, 6609 Rosecroft Place, Falls Church, VA 22043) reveals a range of titles spanning a General Motors parts catalog, Italian tax law information, a telephone directory encompassing all of New York State and New England, 2 years' worth of the *Daily Oklahoman*, the *Registry of Mass Spectral Data*, the venerable Medline medical database, UMI's Dissertation Abstracts, and hundreds more.

CD-ROM AND VUI: LORETTA SWIT VS. THE A> PROMPT

No DOS prompt. No Mac desktop. Instead, your computer greets you in the morning with the beaming face of Alan Alda or Loretta Swit, cheerfully asking, "What can I do for you, Aloysius?" When you say, "Check the mail," the Sesame Street postman kindly obliges.

Wonderful? Horrible? Well, something like it might just be the next step beyond the "Gooney" (GUI) graphical user interface offered by the Macintosh and Windows. Some visionary folks at companies like Lotus suspect that what people may really want instead is a TV-like "Vooney" (VUI)—video user interface. And they suspect that the compact disk might be the vehicle that takes us there.

VIDEO APPS Video capabilities are actually included in every CD audio disk. Unfortunately, the 24MB of "subcode" that can be stored on any 1-hour CD amounts to roughly a single low-resolution TV picture every 7 seconds; decoding equipment is so rare that few audio disks bother to include video at all.

The newer CD-V (CD-Video) won't have much impact on computer applications. CD-V is a Philips/Sony-designed consumer product specifically intended for 5-minute noninteractive "video singles" playable on "Combi" CD-Laser-Disc players. Disks are available now; they have not exactly set the entertainment world on fire.



This DVI golf simulation mixes multiple video images with digital text. A joystick interface lets you tour the links by making "shots" whose results modify the views.

Then there's CD-I (CD-Interactive). This Philips/Sony standard is intended primarily as a consumer product: a "closed system" with a built-in micro-processor plus a pointing device (joystick, mouse, whatever) for user input, and cables to hook the thing up to a TV set and stereo system. The "Green Book" specs for CD-I players require a

Motorola 68000 series chip and RTOS (Real-Time Operating System, a variant of OS-9) in ROM. The goal: interactive video applications, complete with text, graphics, audio, and limited animation—for the computerless masses.

But the recent joint announcement of the CD-ROM XA format by Philips, Sony, and Microsoft brings the computer

CD-ROM VS. OTHER FORMATS The main advantage of a CD-ROM over its print counterpart is the greater ease of searching it—and the ability to capture and process the results of a search. R.R. Bowker's *Books in Print Plus*, for example, goes beyond its print counterpart by offering complex Boolean searches on multiple fields—and then goes even further, letting the user generate a book order (either on paper or on-line) from what was found. *Microsoft Bookshelf* pops up to let

you paste a quote from Bartlett's *Familiar Quotations* directly into your word processor (complete with a copyright notice that you may delete at your own discretion); if you're willing to tolerate some very long waits, you can even turn its dictionary into the world's greatest thesaurus simply by searching for words in the definition field—something that has never before been possible.

So far, however, CD-ROM versions of print media tend to omit graphics-based in-

formation: for example, Grolier's *New Electronic Encyclopedia* includes none of the photos or diagrams of the paper edition—largely because many libraries (the product's target market) are unequipped to display such images. And formatting of tabular and other exotic material can become so complicated that some databases simply omit it.

The main advantage of a CD-ROM database over an on-line counterpart is the ability to disseminate it freely. A public li-

back into the picture by bridging some of the distinctions between CD-ROM and CD-I. Like CD-I, CD-ROM XA will employ "FM quality" ADPCM (Adaptive Differential Pulse Code Modulation) audio—an efficient encoding method that uses "delta compression" to record *changes* in pitch and volume rather than represent them absolutely. The audio can be interleaved with other data, enabling high-quality sound to play in sync with what's happening on-screen. And like CD-I, the CD-ROM-XA standard will include a 640 by 480 resolution mode with 256 colors out of more than 16 million in a color lookup table scheme.

Most significantly, the CD-ROM XA announcement states that retrieval software "for each target system" can be stored on-disk. Therefore, some (but not all) CD-I disks should play in an MS-DOS CD-ROM XA drive, and some XA disks should play in a CD-I machine. The upshot: Microsoft, which once seemed shut out of CD-I entirely, now appears to be deeply involved with it.

Still, you'll probably have to shell out for at least a new adapter card and perhaps a whole new CD-ROM player with special circuitry to decode the audio and video on CD-ROM XA disks. And so far, CD-ROM XA is still only an announcement of an agreement that a standard will be developed. Players may be a long way down the pike.

As they are in the CD-I world. Philips

sees industrial-model (read: expensive) CD-I machines in June 1989 and consumer versions for early 1990, but skeptics note that's already 2 years behind schedule. And CD-I and XA both have serious drawbacks when it comes to picture quality. Computer animation and still photos should look fine, but at best the CD-ROM's slow data transfer rate (pronounced "bandwidth" in this context) lets CD-I refresh a full screen of TV-quality video no more than 1.5 times per second— $1/30$ of the TV-standard 30 frames. By drastically reducing the size of the TV window, CD-I can offer a fair simulation of TV video—but it's kind of like squinting at a Watchman in the middle of a projection TV.

GE/CA's DVI (Digital Video Interactive) technology directly addresses the bandwidth problem. DVI uses delta and ADPCM techniques, but its special forte is *asymmetric* compression. During the off-line preparation of a CD-ROM, the DVI process requires about 3 seconds of a powerful Meiko parallel-processing number-cruncher's time to compress each image frame at a staggering 120:1 ratio. But at playback, everything happens in real time: the powerful (12.5 MIPS) DVI chip set decompresses the image on the fly. The result: up to 72 minutes of full-screen, full-motion digital video (at a resolution of 256 by 240, with 16 million colors) can squeeze onto a single standard CD-ROM.

Fully digital video can be manipulated with ease—as the gasps of amazement at DVI demonstrations attest. Truly interactive TV lets you use a joystick to "look around" in any direction and "walk" at a speed you control. "Synthetic" video lets you overlay photographic textures and colors onto 3-D models of rooms and furniture. And DVI offers much more, including on-the-fly "exact reproduction" compression for high-resolution graphics and a 10-frame-per-second "edit-level" mode for video development.

DVI's major obvious drawback is that you need a DVI system to decode its disks. DVI is now available only as a three-board set for standard 16-bit PC AT slots: one for video, one for audio, and one to control a CD-ROM drive and joystick. Currently in beta testing, the boardset is expected to roll out to the public for \$7,000 to \$10,000 (depending on configuration) in first quarter 1989. Development software and support are likely to run another \$15,000. It's fair to guess that developers of high-end interactive video applications will be the major DVI pioneers. But increasing integration could bring prices down fast.

And who knows? If DVI chip sets become as common as EGAs and Radars, O'Reilly starts butting in and offering his assistance as you get up for your coffee break—well, don't say we didn't warn you.—**Stephen Manes**

brary may be wary about incurring expensive on-line fees for every customer who steps through the door; once a CD-ROM version of the database is in place, there's no additional fee for unlimited use.

FINDING THE NEEDLE Occasionally the data on a CD-ROM disk is supplied in raw form—simple ASCII or other standard-format files designed to be accessed via normal DOS techniques. Far more often, the data comes with search-and-re-

trieval software that makes it relatively simple to find the 2K needle you're looking for in the half-gigabyte haystack.

Retrieval software can be as important as the data it supports. Using the software that comes with a CD-ROM database is often the only way to even examine the data, which may well be stored in encrypted form and decrypted on the fly. The software largely determines how you can access the data (full Boolean searches, Boolean with wildcards, Boolean with

proximity, and just plain browsing are among many possible options) and what you can do with the data you find—paste it into your reports, save it to a disk file, send it to the printer, or keep it on the screen in a window while you do more exploring.

The quality of retrieval software varies tremendously. ALDE's *Pravda* database takes cons to load and seems ridiculously primitive; Lotus's *Bluefish* retrieval software, supplied with its databases, works much faster and offers a far slicker inter-

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□ Learning DOS 2.0 (for any DOS version)	35.
□ Windows 286 2.1	69.
□ Windows 286 2.1 w/Mouse	145.
□ Works 1.05	99.
□ Windows 386 2.1	129.
□ Word 4.0	209.
□ Chart 3.0	259.
□ Excel 2.1 (requires 80286/80386 CPU)	319.
□ Word 4.0 Network Version	499.

CD-ROM

□ Bookshelf 1.0 w/Amdex Laser Drive	799.
□ Programmers Library 1.0	269.

LANGUAGES

□ Quick BASIC 4.5	69.
□ Quick C 1.01	69.
□ Macro Assembler 5.1	99.
□ Basic Compiler 6.0	199.
□ Pascal 4.0	199.
□ Fortran 4.1	289.
□ C Compiler 5.1	299.
□ Cobol 3.0	599.

Nantucket Software ... NCP

□ Clipper (Summer '87, d33 Plus compiler)	429.
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New England Software ... NCP

□ Graph-in-the-Box Release 2	75.
□ GB-Stat 1.0	159.
□ GB Analytic 1.0	105.

Nolo Press ... NCP

□ WinMaker 3.0	35.
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North Edge Software ... NCP

□ Timeslips III 3.3	119.
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Owl International ... NCP

□ Guide 2.0	143.
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PC Connection Software Special

through January 31, 1989

MECA ... NCP

Andrew Tobias' Tax Cut 1040

A powerful partnership has developed to help you through this tax season. Best Programs has teamed up with MECA Ventures to bring you Andrew Tobias' Tax Cut. Some program features of this "early bird version" include:

- Integration with MECA's Managing Your Money to bring you a complete financial system
- Completely up-to-date with current tax laws
- Final calculations are certified by an independent accounting firm before product is shipped to you
- Free upgrade for this "early bird version" directly from MECA

Andrew Tobias' Tax Cut 1040 for 1988

Taxes \$49.

Paperback Software ... NCP

□ VP-Info 1.4	\$65.
□ VP-Planner Plus 2.0	145.
□ VP-Expert 2.0	145.

Paul Mace ... NCP

□ H/Text H/Format 2.0 (hard-disk tools)	49.
□ Mace Utilities 5.0 (DOS utilities)	55.
□ Grasp 3.1	79.
□ Nvelope 1.01	29.

PC Support Group ... NCP

□ Lightning 4.82	57.
□ Lucid 3-D 1.22	89.

Personics ... NCP

□ SmartNotes 2.0	49.
□ SeeMORE 1.0	59.
□ Look&Link 1.01	79.
□ Ultravision 1.0	119.

@BASE 1.1

Peter Norton ... NCP

□ Norton Editor 1.21	39.
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1-800/243-8088



PC Connection

6 Mill Street

Marlow, NH 03456

603/446-3383 FAX 603/446-7791

□ Norton Commander 2.0 \$45.

□ Advanced Utilities 4.5 79.

□ Dan Bricklin's Demo Program 2. 99.

Quarterdeck ... NCP

□ DESQView 2.2	79.
□ Expanded Memory Manager 4.2	39.

Reference Software ... NCP

□ Grammatik III 1.05 (electronic proofreader)	52.
□ Reference File 5.03 (pop-up DB manager)	49.

Relay Communications

□ Relay Gold 3.0	149.
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Revolution Software ... NCP

□ VGA Dimmer (screen saver)	19.
□ DJ (disk manager)	39.
□ Cruise Control 3.02	39.

Rightsoft ... NCP

□ Rightwriter 3.0	54.
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Simon & Schuster ... NCP

□ Professional Thesaurus 1.0	79.
□ Typing Tutor IV	33.

Softlogic Solutions ... NCP

□ Software Carousel 2.02	49.
□ Disk Optimizer 4.01 (w/Data Guardian)	45.
□ @Liberty 1.1	119.
□ Cubit 2.02	45.
□ Double DOS 4.02	45.
□ Magic Mirror 1.0	59.

SoftView ... NCP

□ TaxView (for 1988 taxes)	special
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Software Group ... NCP

□ Enable 2.0	399.
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Software Publishing ... NCP

□ Professional Plan 1.01	59.
□ PFS: First Publisher 2.0	79.
□ PFS: First Graphics 1.0	95.
□ PFS: First Choice 3.01	99.
□ Professional Write 2.0	125.
□ Professional File 2.0	189.
□ Office Writer 6.0	259.
□ Harvard Graphics 2.1	309.
□ Harvard Graphics Accessories	call
□ Harvard Project Manager 3.0	439.

Spinneker ... NCP

□ Resume Kit 1.0	25.
□ Eight-in-One 1.1	39.
□ Splash 1.0	59.
□ PinStripe Presenter 1.0	115.

Springboard ... NCP

□ Newsroom Pro 1.0	45.
□ Certificate Maker	34.
□ Clip Art 1	19.
□ Clip Art 2	25.
□ Clip Art 3	19.

Symantec ... NCP

□ SQZPlus 1.11	59.
□ 4Word 2.0	59.
□ Q & A Write 1.01	119.

For IBM Personal Computers exclusively.

PC CONNECTION®

ALL ITEMS SUBJECT TO AVAILABILITY PRICES SUBJECT TO CHANGE WITHOUT NOTICE

The glow on the screen,

*told a tale sad but true. I'd forgotten
to get presents for people I knew! A modem for mother,
Zork for the kids. Flight Simulator for the chief,
and a hard drive for Sid.*

Grandview 1.0	\$175.
Q & A 3.0 (database, word processor)	209.
Breakthrough Timeline 3.0	349.
Spreadsheet Analyst 2.5	49.
Note-It Plus 1.02	49.
Think Tank 2.4NP	115.
4 Views 1.0	89.
Q&A Network Pak 1.0 (requires Q&A)	179.

T/Maker ... NCP	
Scrapbook + 1.0	79.
ClickArt Business Images	42.
ClickArt Holidays	42.
EPS (PostScript) Illustrations	79.

The XTREE Co. ... NCP	
XTREE Pro 1.0	69.
Hot 4.0	95.

TOPS ... NCP	
Flashcard (AppleTalk network card; 1 year warranty)	169.
NetPrint 2.0 (share printers)	119.
TOPS 2.0	119.
TOPS Repeater (extends network)	132.

Traveling Software ... NCP	
Battery Watch 1.0 (3 1/2" only)	27.
Laplink Mac 1.2 (Mac-PC transfer)	79.
Laplink Plus 2.1	85.
Desklink 2.21	99.

True BASIC, Inc. ... NCP	
True BASIC 2.03 (now includes Runtime)	57.
Kerny/Kurtz Math Series	32.
True Basic Libraries	32.

Vericomp ... NCP	
SoftBytes 2.0	35.
SoftBytes 386 2.53	49.

WordPerfect Corp. ... NCP	
WordPerfect Library 2.0	69.
WordPerfect 5.0	255.
WordPerfect 5.0 Add'l Network Stations	84.
WordPerfect Office 2.0	269.
WordPerfect Office 1.0 Add'l Network Stations	84.

WordPerfect Network Server 5.0	349.
DataPerfect	299.
WordPerfect Executive	129.

Wordtech ... NCP	
DBXL 1.2	119.

Xerox ... NCP	
Ventura Publisher 2.0	call
XyQuest ... NCP	
XyWrite III Plus 3.54 w/Ais-Carte Menus	239.

RECREATIONAL/EDUCATIONAL

Accolade ... CP (reqs. graphics brd.)	
Bubble Ghost	22.
Mean 18	29.
Hardball (baseball simulation)	11.

PC Connection Hardware Special

through January 31, 1989

Intel ... 5 years Above Board Plus 512k Above Board 2 Plus 512k Above Board Plus I/O 512k

Intel has introduced their new generation of memory expansion products for the PC, XT, AT, and PS/2 Models 25, 30, 50, 50Z and 60. Features include:

- Above Board Plus and Plus I/O hold up to 8 Meg in one slot when used with the 6 Meg piggyback option
- Above Board 2 Plus for PS/2 Models 50, 50Z and 60 can use 256k SIMMs for 8 Meg maximum
- Full LVM EMS 4.0 support in hardware; compatible with Windows 2.x, DESQview, and OS/2
- Switchless installation

Above Board Plus 512k	\$419.
Above Board 2 Plus 512k	\$469.
Above Board Plus I/O 512k	\$519.

Testdrive (driving simulation)	\$24.
Jack Nicklaus' 18 Greatest Holes	29.
Grand Prix	22.
4th & Inches	22.

Broderbund ... CP

Where in the World is Carmen SanDiego?	25.
Where in the USA is Carmen SanDiego?	25.
Where in Europe is Carmen SanDiego?	29.
Toy Shop	39.
Ultima IV	35.
Ultima V	39.

Electronic Arts ... CP (reqs. graphics brd.)

One-on-One/Bird vs Jordan	29.
Chuck Yeager's Flight Simulator	32.
Chessmaster 2100	35.
Earl Weaver Baseball	32.
Empire	35.

Mavis Beacon Teaches Typing	35.
Sentinel Worlds	39.
Grand Slam Bridge	45.

Infocom ... NCP

Zork Trilogy	33.
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Lifestyle Publishing Group ... NCP

Golf Doctor (improve your game)	33.
Golf's Best Pinehurst #2 (play the best)	32.
Golf Statkeeper (includes USGA Handcapper)	27.

19th Hole Special (3 Golf programs above bundled with Mr. Boston Micro Bartender's Guide)	special
Mr. Boston Official Micro Bartender's Guide	\$18.
Micro Video Companion	24.
Take Control of Cholesterol	24.

Microprose ... CP

F-19 Stealth Fighter (requires CGA or EGA)	39.
F-15 Strike Eagle (requires CGA)	22.
Gunship (requires CGA or EGA)	32.

Microsoft ... NCP

Flight Simulator 3.0 (reqs. graphics brd.)	35.
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Parlor Software ... CP

Bridge Parlor (best bridge simulation)	49.
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Sierra On-Line ... CP

Leisure Suit Larry (All require Hercules, CGA or EGA)	25.
Space Quest II	33.
King's Quest IV (512k version)	33.
Marlrunner	33.
Police Quest	33.
Police Quest II	33.
Leisure Suit Larry II	33.
Thor	24.
3D Helicopter	33.

Simon & Schuster

Star Trek: Rebel Universe	29.
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Sphere, Inc. ... NCP

Orbiter (shuttle simulation)	27.
GATO (submarine simulation)	12.
Jeans (edding mind teaser)	24.
Falcon (F-16 simulation, reqs. graphics brd.)	32.

Spinnaker ... NCP

Sargon III (chess game)	15.
Kids on Keys (ages 3 to 9)	19.
Facemaker Gold (ages 3 to 8)	25.
Kindercomp Gold (ages 3 to 8)	25.
SAT Preparation Program	25.
Kidwriter Gold (ages 6 to 10)	32.
Homework Helper—Math (grades 7-12)	32.
Homework Helper—Writing (grades 7-12)	32.

Stone & Assoc. ... NCP (reqs. graph. brd.)

Algebra Plus (ages 13 to adult)	27.
Memory Master (ages 2 to 6)	27.
My Letters, Numbers, Words (2 to 6)	22.
Second Math (ages 7 to 16)	22.

Sublogic ... NCP

Jet 2.1 (requires EGA or CGA)	33.
Scenery Disks	each 15.
San Francisco Star Scenery Disk	18.
Japan Scenery Disk	15.

The Learning Company ... CP

Math Rabbit (ages 4 to 7)	26.
Reader Rabbit (ages 4 to 7)	26.
Writer Rabbit (ages 6 to 12)	26.

XOR ... NCP

NFL Challenge 2.0	69.
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For IBM Personal Computers exclusively.

PC CONNECTION®

It gave me great pain,

There was so much to do!

How could I possibly see this list through?

*When what to my wondering eyes should appear, but
PC Connection's number big, bold, and clear.*

HARDWARE

Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.

Alloy ... 1 year	
Tape System2 (for PS/2 MicroChannel) ...	\$299.
Retriever140 (for IBM AT & compatibles) ...	349.
AST Research ... 2 years	
I/O Mini 2 C/S/P ...	89.
SixPackPlus 64k C/S/P (upgrades to 576k) ...	129.
Advantage Premium 512k S/P (upgrades to 1 Meg or 2 Meg w/Piggyback) ...	call
Advantage 2 512k (for PS/2 Models 50/60) ...	call
Advantage 2-386 (for PS/2 Model 80) ...	call
RAMpage 256 512k (for XT286/AT) ...	call
RAMpage! Plus MicroChannel 512k (for PS/2 Models 50/60) ...	call
Amdex ... 90 days	
LaserDrive-1 (external CD-ROM Drive) ...	629.
LaserDrive-2 (internal CD-ROM Drive) ...	629.
CompuCable ... 2 years	
2-Position switch box ...	29.
3-Position switch box ...	39.
Cuesta ... 1 year	
Datasaver 400 Watt (standby power backup unit for the AT) ...	459.
Curtis ... lifetime	
ACCESSORIES	
Curtis Clip CC-1 ...	6.
Disk Holder DB-1 (holds 50 5 1/4" disks) ...	8.
3 1/2" Disk Holder DB-2 (holds up 40 disks) ...	8.
3 1/2" Diskette Cleaning Kit CK-2 ...	16.
Printer Stand PS-1 ...	18.
Universal System Stand SS-3 ...	25.
Static Mat SM-2 ...	25.
Toolkit TK-1 ...	25.
DS-1 Switch Box (controls 2 printers) ...	33.
CABLES	
Smartmodem to PC Cable EC-7 (9 feet) ...	17.
Printer to IBM cable EC-6 (9 feet) ...	17.
PS/2 Keyboard Extension Cable EC-9 ...	25.
Keyboard Extension Cable EC-2 ...	25.
SURGE SUPPRESSORS	
Safesrip SP-3 (6 outlets; 1 year warranty) ...	21.
Filtered Safesrip SPF-3 ...	21.
Diamond SP-1 (6 outlets) ...	29.
Emerald SP-2 ...	36.
Diamond Plus SP-1 Plus ...	41.
Sapphire SPF-1 ...	45.
Ruby SPF-2 (6 outlets; EMVRFI filtered; 6 ft cord) ...	55.
Ruby-Plus SPF-2 Plus (w/FAX & modem protection) ...	69.

PC Connection Software Special

through January 31, 1989

SoftView ... NCP

8 TaxView for 1988 Taxes

Be prepared to face this tax year head on with SoftView's TaxView. See your tax form right on your PC screen. All calculations will be done automatically for you. And if you have a question, simply consult with the IRS instructions which are right on your screen. Other features include:

- Prints entire form with all data
- Links and updates all forms on each change
- Imports text files from spreadsheets, databases, and accounting programs
- Includes tax planner
- Supports over 75 IRS forms and schedules

TaxView for 1988 Taxes ... \$69.

DCA ... 1 year

Irma 2 (3270 emulation board) ... \$729.

Irma 2 Micro Channel (for PS/2 Models 50/60/70/80) ... 729.

Epson ... 1 year

We are an authorized Epson Service Center.

FX-850 (80 col., 264 cps, 9 pin) ... call

FX-1050 (136 col., 264 cps, 9 pin) ... call

LQ-500 (80 col., 180 cps, 24 pin) ... call

LQ-850 printer (80 col., 264 cps, 24 pin) ... call

LQ-1050 printer (136 col., 264 cps, 24 pin) ... call

LQ-2550 printer (136 col., 400 cps, 24 pin) ... call

LX-800 printer (80 col., 180 cps, 9 pin) ... call

Printer to IBM cable (6 feet) ... 15.

Everex ... 1 year

1200 Baud Internal Modem ... 79.

2400 Baud Internal Modem ... 149.

5th Generation ... 1 year

Logical Connection 256k ... 479.

Logical Connection 512k ... 539.

Hayes ... 2 years

Smartmodem 1200 ... 299.

1-800/243-8088



PC Connection

6 Mill Street

Marlow, NH 03456

603/446-3383 FAX 603/446-7791

Smartmodem 1200B (with Smartcom II) ...	\$299.
Smartmodem 1200B (hardware only) ...	265.
Smartmodem 2400 ...	449.
Smartmodem 2400B (with Smartcom II) ...	449.

Hercules ... 2 years

Graphics Card Plus ... 189.

Network Card Plus (with TOPS DOS) ... 339.

Incolor Card ... 229.

Intel ... 5 years

2400B Modem (internal modem for IBM-PC/XT/AT) ... 249.

2400B Modem 2 (internal modem for PS/2 Models 50/60/80) ... 269.

Inboard 386/PC w/1 Meg ... 699.

Inboard 386/AT 0k (req. installation kit) ... 899.

Inboard Installation Kit (specify computer) ... 139.

Above Board Plus 512k ... special

Above Board 2 Plus 512k ... special

Above Board Plus I/O 512k ... special

Connection Coprocessor (FAX board plus) ... 769.

Optional 2400 Baud Modem for Connection Coprocessor ... 229.

MATH COPROCESSORS

8087 (for IBM-PC & XT) ... 105.

8087-2 (8 MHz; for PS/2 Models 25 & 30) ... 149.

80287 (for AT & XT286) ... 165.

80287-8 (for 8 MHz 80286 machines) ... 239.

80287-10 (for PS/2 Models 50 & 60) ... 279.

80387 (for 16 MHz PS/2 Model 80) ... 439.

80387-20 (for 20 MHz PS/2 Model 80) ... 499.

Kensington Microware ... 1 year

Masterpiece (with \$15 rebate thru Dec.) ... 94.

Masterpiece Plus (with \$15 rebate thru Dec.) ... 109.

Keytronic ... 3 years

101 Keyboard ... 99.

101 Plus Keyboard (enhanced layout) ... 99.

Kraft ... 5 years

Three-button Joystick ... 33.

High Speed Joystick Adapter Card ... 25.

Adapter Card3-Button Joystick Bundle ... 49.

KYE International ... lifetime

Dyna Mouse GM-6 Plus (w/Dr. Halo III) ... 54.

Logitech ... lifetime

Series 2 Mouse (for PS/2 50/60/70/80) ... 65.

HFEZ Mouse (bus only) ... 89.

Mouse w/Print Show (bus or serial) ... 95.

Mouse w/LogiCAD (bus or serial) ... 119.

ClearCase Mouse (serial only) ... 99.

ScanMan (hand held scanner) ... 199.

Microsoft ... lifetime

Mach 20 ... 349.

Disk + Option (for Mach 20) ... 69.

Memory + Option (for Mach 20) ... 339.

Mouse with Paintbrush (bus or serial) ... 109.

Mouse with Easy CAD (bus or serial) ... 125.

Mouse with Windows/286 (bus or serial) ... 145.

For IBM Personal Computers exclusively.

PC CONNECTION®

*DEFECTIVE SOFTWARE REPLACED IMMEDIATELY DEFECTIVE HARDWARE REPLACED OR REPAIRED AT OUR DISCRETION

Call 800/243-8088.

*I dialed that number. They got it all straight.
And I heard them exclaim as they resolved my poor plight,
"Happy Holidays to all, and to all
a good night."*

MSC Technologies ... lifetime

OmniMouse w/Designer Pop-up menus (serial only; 1 year warranty) ...	\$57.
PC Mouse II w/PC Paint+ (bus or serial) ...	89.
PC Mouse II w/Autosketch (bus or serial) ...	105.

NEC ... 2 years

Multisync Plus (960 x 720 max. resolution) ...	949.
Multisync II (800 x 560 max. resolution) ...	call

NSI Logic ... 3 years

Smart VGA (supports full VGA specs) ...	229.
ProDesigner VGA ...	319.
RAMquest Xtra 16/32 (k) ...	339.

Orchid Technologies ... 2 years

RAMquest 2-Z (k) ...	199.
Tiny Turbo 286 (accelerator board) ...	289.
ProDesigner VGA ...	319.
RAMquest Xtra 16/32 (k) ...	339.

PC Power & Cooling Systems ... 1 year

REPLACEMENT POWER SUPPLIES	
Turbo Cool 150 (run 25° - 40° cooler) ...	129.
Turbo Cool 250 (run 25° - 30° cooler) ...	169.
Silencer 150 (84% noise reduction) ...	115.
Silencer 200 (69% noise reduction) ...	149.

PC Support Group ... 1 year

Breakthrough 286 Acos. Board (8 MHz) ...	299.
Breakthrough 286 Acos. Board (12 MHz) ...	449.

Practical Peripherals ... 5 years

1200 Baud Internal Modem (w/ProComm) ...	69.
1200 Baud External Modem (mini) ...	79.
PILink (parallel line extender/32k) ...	109.
Microbuffer Inline (par. print buffer/32k) ...	135.
2400 Baud Internal Modem ...	151.
2400 Baud External Modem ...	181.

Princeton Graphics ... 1 year

Ultrasync (supports CGA, EGA, VGA) ...	549.
Max15 Monochrome Monitor ...	269.

Safe Power Systems ... 2 years

Safe 250W (standby power backup) ...	249.
Safe 425W (standby power backup) ...	369.

Toshiba ... 1 year

P321SL printer (80 col., 216 cps, w/tractor) ...	529.
P351SX Printer (132 col., 360 cps) ...	999.
T1000 Laptop (80C88, 6.4 lbs., 5 hr. battery) ...	call
T1200 Laptop (80C86, 10 MHz, 20 Meg) ...	call
T1200HB Laptop w/Backlit screen ...	call
T1200F Laptop Dual Floppy System ...	call
T1200FB Laptop Dual Floppy System w/Backlit screen ...	call
T1300/20 Laptop (80286, 8 MHz, 20 Meg) ...	call
T3200 Laptop (80286, 12 MHz, 40 Meg) ...	call
T5100 (80386, 16 MHz, 40 Meg) ...	call
External 5 1/4" Drive for Laptops ...	369.
768K RAM Card for T1000 ...	299.
1 meg EMS Card for T1000 -/T1200 ...	499.

Video 7 ... 5 years

VEGA Deluxe (supports 640x480) ...	219.
VEGA VGA (supports full VGA specs) ...	287.
FastWrite VGA ...	399.
VRAM VGA ...	529.

DRIVES

IOMEGA ... 1 year

Dual 20 Meg Bernoulli Box (8") ...	\$1679.
20 Meg Cartridge (8") ...	82.
20 Meg Tripak (8") ...	244.
Bernoulli II Single 20 Meg Internal (5 1/4") ...	767.
Bernoulli II Dual 20 Meg External (5 1/4") ...	1659.
20 Meg cartridge (5 1/4") ...	59.
20 Meg Tripak (5 1/4") ...	169.
PC2 Card ...	169.
PC2B Card (bootable card for PC/XT/AT) ...	229.
PC4 Card for PS/2 Model 50/60/70/80) ...	299.

Mountain Computer ... 1 year

40 Meg Internal Tape Drive (XT, AT or PS/2) ...	379.
40 Meg External Tape Drive (XT, AT or PS/2) ...	479.
40 Meg External Tape Drive w/Power Supply (XT, AT, or PS/2) ...	569.

Plus Development ... 2 years

Hardcard 20 Meg (49 ms) ...	549.
Hardcard 40 Meg (28 ms) ...	699.
Pessport (20 or 40 Meg removable drives) ...	call

Seagate ... 1 year

FREE PCTV® Hard Drive Installation Tape with the purchase of 20, 30 or 40 Meg Seagate drive for the IBM PC (not for AT). Specify Beta or VHS.

20 Meg Internal Hard Drive ST225 (w/controller and cables, 65 ms) ...	299.
30 Meg Internal Hard Drive ST238 (w/controller and cables, 65 ms) ...	329.
40 Meg Internal Hard Drive for AT (40 ms) ...	399.
40 Meg Internal Hard Drive for XT (w/controller and cables, 40 ms) ...	469.
40 Meg Internal HD ST251-1 for AT (28 ms) ...	469.
80 Meg Internal HD ST4096 for AT (28 ms) ...	689.

TEAC ... 1 year

PC, XT 360k Drive (5 1/4" half height) ...	89.
720k Drive (3 1/2" half-height, specify XT or AT) ...	95.
1.44 Meg Drive for AT (3 1/2" half-height, includes Bascosoft software utilities) ...	125.

Toshiba ... 1 year

AT 360k Drive (5 1/4" half-height) ...	89.
AT 1.2 Meg Drive (5 1/4" half-height) ...	99.

DISKS

All disks have a lifetime warranty.

5 1/4" DS/DD Disks for PC & XT (360k) ...	
Fuji MD2D (10 disks per box) ...	12.
Sony (10 disks per box) ...	12.
Maxell MD2-D (10 disks per box) ...	13.
Verbatim Datalife (10 disks per box) ...	13.

5 1/4" DS/High Density Disks for AT (1.2 Meg)

Fuji MD2HD (10 disks per box) ...	\$22.
Sony (10 disks per box) ...	23.
Maxell MD2-HD (10 disks per box) ...	23.
Verbatim Datalife (10 disks per box) ...	22.

3 1/2" DS/DD Diskettes (720k)

Sony (10 disks per box) ...	19.
Fuji (10 disks per box) ...	19.
Maxell (10 disks per box) ...	20.

3 1/2" DS/High-Density Diskettes (1.44 Meg)

Sony (10 disks per box) ...	55.
Fuji (10 disks per box) ...	55.
Maxell (10 disks per box) ...	59.

MISCELLANEOUS

CompuServe

CompuServe Information Service ...	24.
Grolier's OnLine Encyclopedia ...	19.

Cables ... lifetime

Smartmodem-to-AT cable (9 feet) ...	15.
Parallel Printer cable (15 feet) ...	19.

OUR POLICY

- We accept VISA and MASTERCARD only.
- No surcharge added for credit card orders.
- Your card is not charged until we ship.
- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax.
- All U.S. shipments insured, no additional charge.
- APO/FPO orders shipped 1st Class Mail, charged by weight.
- Allow 1 week for personal and company checks to clear.
- COD max \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products.*
- To order, call us Monday through Friday 9:00 to 9:00, or Saturday 9:00 to 5:30. You can call our business offices at 603/446-3383 Monday through Friday 9:00 to 5:30.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For monitors, printers, Bernoulli Boxes, computers, and hard drives, pay actual charges. Call for UPS 2nd Day & Next Day Air.
- For all other items, add \$3 per order to cover UPS Shipping. For such items, we automatically use UPS 2nd Day Air at no extra charge if you are more than 2 days from us by UPS ground.
- Hawaii:
- For monitors, printers, Bernoulli Boxes, and computers, add UPS Blue charge will be added. For all other items, add \$3 per order.
- Alaska and outside Continental US:
- Call 603/446-3383 for information.

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PC Presents.

You better not pout!

('Cause Santa Dos is coming to town.)

Here in the yuletide town of Marlow, NH (pop. 556), most of our neighbors have rather traditional ideas of holiday gift giving. For software, a nice new pair of red thermal underwear would be a real hearth warmer. Hardware? Well, a chainsaw might be really sharp. And, as for utilities, a telephone and running water would be welcome additions to some homes. Nevertheless, being hip to the trendy tastes of the microcomputer age, our very presentable mascots are making sure that we're well-stocked with PC games and gadgets for the byte-bitten on your Christmas or Hanukkah list.

It's a wrap!

People often ask us why we go to such lengths to satisfy customers. Well, our Customer Service Director thinks it's good business. Our Advertising Director thinks it makes good copy. Our mothers think it's their influence. But, actually, we give such

nice (as opposed to naughty) service because of that famous list that Santa and his raccoons are making (and checking twice, we hear). But, frankly, we're a little worried about companies who don't give toll-free support, or who charge your credit card before they ship, or who don't ship backorders free, or who have developed any of those other naughty mail order habits. It's lump o' coal city for those dudes.

You're gonna get what's coming.

At our modest headquarters in the former Christmas Trees Inn in Marlow, we're frantically doing our last minute holiday shopping. If you want to be on our list, just place an

order of \$500 or more by January 31st, and you will get your very own surprise present from PC Connection! Specially programmed to self-destruct if opened before Christmas.

Just call 1-800/243-8088 or 1-603/446-3383, M-F 9:00 to 9:00; Saturday to 5:30. If you're planning to visit please call ahead.



A surprise present which will no doubt feature our most gifted mascot. Offer not available to net accounts. One per customer.

For IBM Personal Computers exclusively.

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■ CD-ROM LIBRARIES

■ In the near future, we're likely to see better retrieval software that includes more-sophisticated searching capabilities and improved support for graphics.

face. Much of the software is unaccountably big—often requiring 512K of free RAM plus hard disk space for temporary files created during searches. And the method and extent of indexing the software uses can be crucial. *Microsoft Bookshelf's* greatest failing is its sluggishness in many operations; had it employed better data indexing techniques, it would have far less recourse to slow brute-force searches.

Retrieval-program interfaces vary at least as much as any others, forcing you to learn the idiosyncrasies of each particular package. The retrieval software sometimes comes on floppy disk, requiring you to install it before you can get to work. Other packages place the software on the CD-ROM; access the program on the drive, and you're ready to roll.

WHAT IT COSTS CD-ROM pricing adheres to no common standard. In some cases—*Microsoft Programmer's Library*, *Microsoft Bookshelf*, and *Grolier's New Electronic Encyclopedia* come to mind—the disk may cost even less than the volumes it contains. But by no means always: the \$395 CD-ROM edition of the 1988 *Physicians' Desk Reference* includes books that retail for a total of \$131 when they're not supplied on a complimentary basis, as they are to many physicians.

Some CD-ROM products come bundled with a drive in a "solution" package. Some are sold on a subscription basis: sign up and you get an annual, quarterly, monthly, or even weekly disk update—plus, in the case of Lotus's CD/In-

vestment package, daily updates on-line.

Pricing of information otherwise available on-line is problematic for the providers. On one hand, they'd like to have you as a CD-ROM customer, particularly if you weren't likely to access their on-line systems anyhow; on the other, they'd like you to keep running up those per-minute charges. Fees of Lotus's various *One Source* business products, for example, run from \$6,500 to \$30,000 per annum.

In the short run, CD-ROM is likely to become a major delivery medium for appropriate databases. In the near future, we're likely to see better retrieval software that includes more-sophisticated searching capabilities and improved support for graphics.

Further out, CD-ROM might just meet the predictions that it will spawn entire new genres of software. Microsoft's recent joint announcement with Philips and Sony of support for the CD XA standard, with its compressed and interleaved audio format and standard graphics formats, moves the industry closer to a day when such multimedia applications as a dictionary that can pronounce every word and display a picture for any definition are commonplace. For now, half a gigabyte in your pocket will have to do.—**Stephen Manes**

CD-ROM Science and Technical Reference Set

With 7,300 articles, McGraw-Hill's *Concise Encyclopedia of Science & Technology* offers thorough but brief explanations of most scientific subjects for a diverse group of professionals. Store this thick reference work on a CD-ROM disk, add the publisher's *Dictionary of Scientific and Technical Terms*, and what you have is the \$325 *CD-ROM Science and Technical Reference Set*.

Because you can access the dictionary without leaving the *Encyclopedia*, it's possible to look up a technical word or formula in a few seconds, then continue with the main text. And with the optional DocuSystem graphics hardware, including a Wyse high-resolution monitor and card and the Reference Technology IPC-1 image processing card (not reviewed), you can view and print all the illustrations and symbolic

OUR REVIEWERS

Bill Howard is an executive editor of *PC Magazine*.

Stephen Manes is a contributing editor of *PC Magazine*.

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Salvatore P. Ricciardi is a senior programmer for PC Labs.

Philip F.H. Rose is a project leader for PC Labs.

mathematical expressions found in the original books.

THE BAD OLD DAYS Before you access any of the disk's helpful information, first you must face an installation procedure that, with its documentation, may remind you of the bad old days of PCs. There's an installation batch file for the retrieval software, but it assumes use of a certain directory on the C: drive. If you want to use a different directory name, the manual instructs you, of all things, to edit the installation batch file with EDLIN. The manual states that the C: drive must be used, but in this day and age it's an unnecessary restriction that takes the user plenty of fiddling to overcome.

The manual appears to be a boiler-plated generic manual for Reference Technology's CLASIX Full Text retrieval software with some appropriate references to the McGraw-Hill disk inserted. The result? It is rife with illogical or poorly constructed sentences and inaccurate explanations. In the explanation of retrieval requests, some of the examples used—apparently from the generic part of the manual—don't correspond to the Science and Technology disk. If entered as instructed in the manual, the searches will not find any matches. Other examples use substituted words that are not consistent throughout the example, making them illogical.

■ CD-ROM LIBRARIES



McGraw-Hill's CD-ROM Science and Technical Reference Set will highlight search words in color, as shown in the lower portion of the screen. If you see an unfamiliar word, a few keystrokes will take you to the dictionary for help.

2 Binary star
18 sup 9 DG F (50 - 500 X 10 sup 6 DG C) and radiates mostly in x-rays. Some

accretion - (astron) A process in which a star gathers molecules of interstellar gas to itself by gravitational attraction. (clv eng) Artificial buildup of land due to the construction of a groin, breakwater, dam, or beach fill. (geol) 1. Gradual buildup of land on a shore due to wave action, tides, currents, airborne material, or alluvial deposits. 2. The process whereby stones or other inorganic masses add to their bulk by adding particles to their surfaces. Also known as aggradation. (meteorol) The growth of a precipitation particle by the collision of a frozen particle (ice crystal or snowflake) with a supercooled liquid droplet which freezes upon contact.

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transfers mass to a hotter and much more compact object, a degenerate white dwarf or a similar body. A viscous disk surrounding the accreting star plays an important role. Variable rates of mass transfer, variable viscosity, and continual interaction between the star, the disk, and the stream lead to instabilities and eruptive events. In the more violent cases, thermonuclear reactions at the surface of the accreting star are believed to be the source of the energy for a nova outburst. See NOVA; VARIABLE STAR.

Page 5

ESC exit; ENTER select; INS new; Page/Tn scroll; ARROWS cursor; * Multipleword

OVER THE HURDLES These obstacles can be overcome, however, and once installed the retrieval software is sufficiently powerful. You enter search specifications through a fill-in-the-blank screen, with specifications for full text, the title, and the author. Required words (ANDs) and words that must not occur (NOTs) are

entered on separate lines, while all words entered on the same line without special delimiters are ORed. Unfortunately, separate lines in a search request can only be combined with AND, so the ORed words or phrases cannot exceed a single 76-character line.

You can also enter proximity and string searches right along with the rest, by using [] and "" delimiters to surround the applicable words. All the search methods can be combined, as long as they fit on a single screen, to create a complex request.

A summary page with article titles and authors is subsequently displayed, and you select an individual article by entering its row number. A single command will take you to the page that contains the highlighted search words. Function keys will take you to the next and previous references or documents. And as for output, selections can be written to file or printer but only in plain ASCII: no special printer or display support is available for text.

Finding any reference in this product is very quick: it took me less than half a minute to look up all references to "neutron star," look at a summary screen, select one reference, and display the full text.

The main reason for the speed is that the full text of both books, including indexes, uses a scant 38MB of the CD-ROM disk. The bulk of the space used, 288 MB, is for the image files containing technical drawings and mathematical formulas.

While these images are enormously useful to those with the optional hardware necessary to view and print them, they are

■ McGraw-Hill's product lets you look up a word in the dictionary, then continue in the encyclopedia's main text.

a waste of space to anyone else. It is unfortunate that the vast space available on a CD-ROM disk could not have been filled with the full text of the 15-volume *Encyclopedia of Science and Technology*, rather than the one-volume Concise edition,



FACT FILE

CD-ROM Science and Technical Reference Set

McGraw-Hill Book Co.
1221 Ave. of the Americas
New York, NY 10020
(800) 2MC-GRAW
List Price: \$325

Requires: 640K RAM, DOS 2.0 or later.

In Short: Combining two well-known scientific reference works, this package makes sense for anyone who uses these reference works often and needs complex search criteria or is required to incorporate the information into computer documents. For less frequent users, the two books may be just as useful.

CIRCLE 107 ON READER SERVICE CARD

■ CD-ROM LIBRARIES



CD-ROM Libraries: Summary of Features

(Products listed in ascending price order)

Traditionally, PC Magazine's Summary of Features table for a given product type is intended as a comparison, a quick reference to help you determine which products in a group offer the most attractive combination of features. But when it comes to mass-market CD-ROM data libraries, direct comparison is impossible: your choice will be determined entirely by your needs, not by the kind of features listed here. If you're looking for an index of magazine articles, for instance, you couldn't be expected to choose *Grolier's New Electronic Encyclopedia* over *Wilson's Reader's Guide to Periodical Literature* simply because the former offers the more sophisticated search parameters.

Moreover, the accompanying retrieval software is most often written with one particular library—and one set of structural challenges—in mind. Overall, a more useful comparison is how well a package will serve you compared to existing print versions of the same information—and how much it will cost when you figure in a compatible CD-ROM drive and interface card.

	Microsoft Bookshelf Microsoft Corp. \$295	CD-ROM Science and Technical Reference Set McGraw-Hill Book Co. \$325	The New Electronic Encyclopedia Grolier Electronic Publishing \$395	Microsoft Programmer's Library Microsoft Corp. \$395	Clip Art 3-D NEC Home Electronics Inc. \$399	Computer Library Ziff Communications Co. \$695
Includes MS-DOS CD-ROM extensions (MSCDEX)	●	○	○	○	○	●
Updates included	None	None	None	None	None	Monthly
SYSTEM REQUIREMENTS						
DOS version	3.1 or later	2.0 or later	3.0 or later	2.0 or later	3.1 or later	3.1 or later
Available RAM	256K (512K if memory-resident)	640K	512K	640K	640K	330K
Compatible CD-ROM readers	Any using MSCDEX	Any using MSCDEX	Amdek Laserdisk; Hitachi 1502/3; Philips CM100; Sony 100, 5002, 6100	Any using MSCDEX	Any using MSCDEX	Any using MSCDEX
RETRIEVAL SOFTWARE						
Vendor	Microsoft Corp.	Reference Technology	Online Computer Systems	Microsoft Corp.	Enabling Technologies	Lotus Development Corp.
Included on compact disk	●	○	○	●	●	●
Can be run from compact disk	●	○	○	○	●	●
Can be run from floppy disk	●	○	●	●	●	○
Can be run from hard disk	●	●	●	●	●	○
Disk space required	300K–600K	490K	200K	200K–700K	1.14MB	500K
Recommended disk space	300K	570K	512K	300K	1.14MB	500K
Requires system file to CONFIG.SYS	●	○	○	○	○	●
Uses runtime driver	○	●	●	○	○	○
Software-selectable driver	○	●	●	○	○	○
DOS INTERFACE						
Preselected search path	●	●	●	●	●	●
Modifiable search path	○	●	○	○	●	○
Path modifiable at search time	○	○	○	○	●	○
Path included in path list file	○	●	○	○	○	●

●—Yes ○—No N/A—Not applicable: Clip Art 3-D does not perform text or document retrieval.

The Original
Oxford English
Dictionary on
Compact Disk
Tr Star Publishing

\$950

○

None

2.1 or later

640K

Any using
MSCDEX

International
Computaprint Corp.

○

○

●

●

475K

500K

○

○

●

●

○

○

○

○

Reader's Guide to
Periodical Literature
H.W. Wilson

\$1,095

○

Quarterly

3.1 or later

640K

Hitachi 1502/3, 2500,

3500; Philips CM100,

CM201, CM210; Sony

100B

H.W. Wilson Co.

○

○

●

●

800K

800K

○

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●

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(continues)

for those not using the images.

Scientists, teachers, students, and others who need frequent access to scientific background material will find that the *CD-ROM Science and Technical Reference Set* affords quick access and easy searching through its standard texts. If you use these reference works often with complex search criteria or need to incorporate the information into computer documents, the CD-ROM makes sense. But if you're a less frequent user, the two books may be just as useful.—Philip F.H. Rose

Clip Art 3-D

As near as 20 years ago, clip art was no more than some black and white images bound into small volumes and sold to innovative but less than talented graphic artists. Ten years ago that tradition migrated over to the rub-on transfer industry and removed the need for innovation: with \$6 and a blunt instrument you could apply innocuous pictographs to any porous surface with no regard for propriety or taste. Following the natural progression of things, it is not surprising that today \$399 will buy you electronic clip art in megadoses from NEC—in the form of *Clip Art 3-D*—provided that you have a computer and a CD-ROM reader handy.

There's always been a dichotomy in computer graphics, with the split falling between graphics images and graphics objects. *Images* are two-dimensional and conform to what most of us call pictures. *Objects* are three-dimensional and are produced by CAD or drafting software. Traditionally, clip art belongs to the image category. NEC's clip art, in contrast, is made up of more than 1,000 graphics objects.

NEC has couched its entire retrieval system in *Windows* and includes a *Windows/286* runtime package in case you're not suitably endowed. Installation is no more complex than installing *Windows*, and NEC has borrowed the standard Microsoft installer to do the job.

The retrieval software itself is called *Clip3D*, which is NEC's adaptation of Enabling Technologies' *Pro3DIPC* ("Upwardly Mobile CADD," *PC Magazine*, December 8, 1987). *Pro3D* really excels in object handling. Select any of seven available light sources and/or a variable

degree of perspective, and you can view the object through 360 degrees of rotation along any axis. With each movement, the shading of the object changes to reflect its new position relative to the light source.

The expand and shrink icons let you change, say, a wine glass into a champagne flute or into a goblet. If the concepts and practice of three-dimensional design are new to you, *Pro3D*—even dressed here as the retrieval software, *Clip3D*—is possibly the best introduction to the problems of perspective and positioning that I've seen in some time. But does that necessarily make a good clip art package?

With over a thousand objects to choose from, you may think there are few barriers between you and clip art heaven with NEC's CD, but clip-art purists may well be disappointed in the quality of the objects themselves. *Pro3D* produces soft objects that are all shading or wireframe, and they lack the crisp attention to detail you can achieve with a painting package. You could never, for example, create that horribly distended post office pointing hand—or even something as simple as a smiling face. Their pastel-like construction, while not inherently evil, just doesn't follow in the tradition of clip art. Also, *Clip Art 3-D*'s CADD-like construction may be too complex and time-consuming, and its slow screen redraw times make it difficult to stifle a yawn.

Likewise, attaching objects to your documents will not be the easiest thing in

PC
Magazine

FACT FILE

Clip Art 3-D

NEC Home Electronics Inc.

1255 Michael Dr.

Wood Dale, IL 60191-1094

(312) 860-9500

List Price: \$399

Requires: 640K RAM, hard disk, DOS 3.1 or later.

In Short: Not clip art in the traditional sense, but a packaging of over 1,000 graphics objects created in a low-end CAD program, *Pro3D*. *Clip3D*, a version of that software, is included as retrieval and editing software, but the lack of feature definition found in the graphics themselves may be disappointing.

CIRCLE 677 ON READER SERVICE CARD

■ CD-ROM LIBRARIES



CD-ROM Libraries: Summary of Features

(Products listed in ascending price order)

	Microsoft Bookshelf Microsoft Corp.	CD-ROM Science and Technical Reference Set McGraw-Hill Book Co.	The New Electronic Encyclopedia Groslier Electronic Publishing	Microsoft Programmer's Library Microsoft Corp.	Clip Art 3-D NEC Home Electronics Inc.	Computer Library Ziff Communications Co.
	\$295	\$325	\$395	\$395	\$399	\$695
DOS INTERFACE						
Multiple search paths	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	●	<input type="radio"/>
Searches through multiple databases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	●	<input type="radio"/>
Searches through multiple CDs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	●	<input type="radio"/>
TEXT SEARCH CRITERIA						
Maximum number of characters per search phrase	80	76	60	70	N/A	105
Multiple phrases	●	●	●	●	N/A	●
Case-sensitive search	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>
Exact phrase match only	●	<input type="checkbox"/>	●	●	N/A	<input type="checkbox"/>
Forces Boolean AND between words	●	<input type="checkbox"/>	●	<input type="checkbox"/>	N/A	●
Excludes prepositions, pronouns, and articles	<input type="checkbox"/>	●	●	●	N/A	●
Boolean operators permitted between phrases:						
AND	●	●	●	●	N/A	●
OR	<input type="checkbox"/>	<input type="checkbox"/>	●	●	N/A	●
NOT	<input type="checkbox"/>	●	●	<input type="checkbox"/>	N/A	●
AND OR	<input type="checkbox"/>	●	●	●	N/A	●
AND NOT	<input type="checkbox"/>	●	●	<input type="checkbox"/>	N/A	●
DATA HANDLING						
Data viewed only through retrieval software	●	<input type="radio"/>	●	●	<input type="radio"/>	●
Mouse support	●	<input type="radio"/>	<input type="checkbox"/>	●	<input type="radio"/>	<input type="checkbox"/>
Arrow-key cursor movements	●	●	●	●	●	●
Page up/down support	●	●	●	●	●	●
Single-key switch to next or previous document	<input type="checkbox"/>	●	<input type="checkbox"/>	●	N/A	●
Jump to specified document	<input type="checkbox"/>	●	●	●	N/A	●
Browse available	●	●	●	●	<input type="radio"/>	●
Save to disk						
All found documents	<input type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	●
Selected documents	<input type="radio"/>	●	<input type="checkbox"/>	●	N/A	●
In ASCII format	●	<input type="checkbox"/>	●	●	N/A	●
In word processing format	<input type="checkbox"/>	●	<input type="checkbox"/>	<input type="radio"/>	N/A	<input type="checkbox"/>
With hard carriage returns	●	<input type="checkbox"/>	●	●	N/A	●
Using any path	●	<input type="checkbox"/>	●	●	●	●
Internal print routine						
ASCII dump	<input type="radio"/>	●	●	<input type="checkbox"/>	●	●
Specific printers supported	None	None	None	None	Any that support Windows	None

●—Yes ☐—No N/A—Not applicable: Clip Art 3-D does not perform text or document retrieval

The Original
Oxford English
Dictionary on
Compact Disk
Tri Star Publishing

\$950

Reader's Guide to
Periodical Literature
H.W. Wilson

\$1,095

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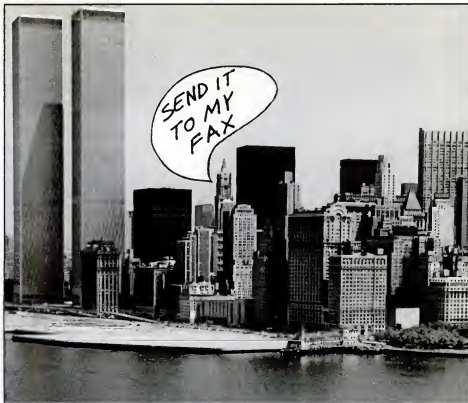
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None

None

(ends)



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Xpedite Systems, Inc.

446 Highway 35
Eatontown, NJ 07724

■ CD-ROM LIBRARIES



NEC borrowed an already proven product, Pro3D from Enabling Technologies, to create its Clip3D retrieval software. As a Windows application, Clip Art 3-D uses the typical pull-down menu assortment that allows you to load images and then modify the physical structure of the object or its lighting composition.



the world. *Clip Art 3-D* is very versatile in its saving options, giving you choices among TIFF, PICT or .PIC if you don't want to use its native file type. But there's no attempt to make the object any easier to handle. A Ferrari done in *Clip Art 3-D* oc-

cupies 120K, while its .PIC equivalent swells to 162K. (*Clip Art 3-D* needed nearly 2 minutes to translate the FERRARI.SOL file into its .PIC counterpart.) It almost seems as if NEC has aimed its artwork specifically at desktop publishing

packages that will more handily accept such file types and sizes.

Does all of this mean that NEC's objets d'art are without merit? Not if you're looking for object handling done very well; and not if you're looking for an entry-level

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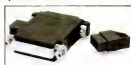
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SOFTWARE PUBLISHING ASSOCIATION
ESTIMATES ONE BILLION DOLLAR LOSS
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■ CD-ROM LIBRARIES

CADD package that comes replete with a host and a half of predesigned objects. But if you're looking for traditional clip art, you might want to do some more looking.—**Bill O'Brien**

Computer Library

One of the truest measures of a software package's usefulness is whether the product naturally fits into the daily work routine. In the case of the \$695-a-year *Computer Library* from Ziff Communications Co., the answer is yes if you need to tap into the vast information pertaining to the computer industry printed in communications, computer, electronics, and technical periodicals.

Admittedly *Computer Library* has a leg up on the competition: as of this writing, there isn't any. Delivered as a monthly update, the disk includes a year's worth of ten computer publications, including this magazine, which makes a total of over 45,000 documents. While the full-text treatment is apparently tilted in favor of the Ziff-Davis family of computer publications, the selection of abstracted publications is nevertheless impressive: offerings as diverse as *AT&T Bell Laboratories*

Technical Journal, *Computers in Biology and Medicine*, *Dr. Dobb's Journal*, and *InfoWorld*. What's missing are some general business and financial periodicals, with their profiles of individuals, companies, and products that drive the industry.

ACCESSING DOCUMENTS Anyone familiar with the standard-issue Lotus command-menu style, pop-up help screens, and mnemonic-based action keys will feel right at home with the *BlueFish* retrieval software. Its clearly written documentation is useful for gaining initial familiarity with the searchware concepts, commands, and functions, and the plentiful help screens take you from there. Of two basic work screens, Log essentially sets the general arena for the work; the other, Browse, gets down to the specifics—moving through and between documents. It's from these screens that the commands go to work.

When you perform a search, the *BlueFish* software responds by seeking matches from the database on each word and phrase within the query. It then records the number of documents containing matches and enters the documents, highlighting query words and phrases, into the Log.



FACT FILE

Computer Library

Ziff Communications Co.

One Park Ave.

New York, NY 10016

(212) 503-4400

List Price: \$695 for 12 monthly updates, plus \$25 shipping fee.

Requires: 330K RAM above 500K free disk space, DOS 3.1.

In Short: A highly functional and useful information resource covering the computer industry with the full text of ten computer publications and abstracts from over 120 related communications, electronics, and business periodicals.

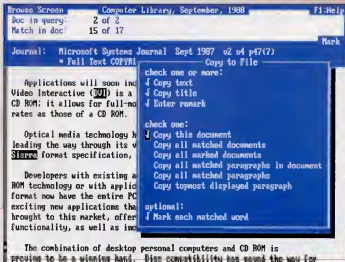
CIRCLE 676 ON READER SERVICE CARD

From here you can view document titles and other summary information using the commands Titles and Browse. You can also progressively narrow the document search range.

Search strategies use the Boolean operators AND, OR, WITHIN, and WITH-OUT, and tighter precision is afforded with variables for proximity searches in the same sentence, paragraph, or docu-



Once you've determined that an article contains the information you need, *Computer Library* will let you mark or tag it for copying to an ASCII file—with the capability of appending already existing files. The Copy menu offers options on where to copy the data.



The ProSpeed™ 386 desktop.



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Or, if you'd like to dissect it yourself, call for product literature at 1-800-826-2255.

NEC

■ CD-ROM LIBRARIES

ment. It can also define searches within any given number of words, sentences, paragraphs, and documents. Hotkeys and other shortcuts help you along throughout *BlueFish's* entire operation.

Up to four words per phrase, ten words per query, or 150 characters can comprise each query, and access time varies accord-

text documents are mostly keystroked rather than picked up electronically—not enough to bother most readers, but enough to be noticeable. Human error, however, has left behind more than five. A search on my last name yielded five articles attributed to me, one of which I didn't write.

Some technological limitations are present as well. Although there's a growing list of file attachments on each update, a suitable format for including features tables and fact files (with their invaluable company addresses and phone numbers) like those in this magazine has not yet been implemented. Mouse support, too, would greatly help this product.

Though *Computer Library* is far from a perfected product, the constant demand for its use around the *PC Magazine* offices points to its usefulness as a pure and simple research tool and information resource on our chosen subject of interest—personal computers. And with a growing list of publications and expansion of the full-text lineup, its market advantage is ensured.

—Greg Pastrick

■ Included in the *Computer Library* are the options to print and copy portions of documents, not quite cut and paste but close enough.

ing to the complexity of the query. A basic search on the words "personal computer" from the September 1988 Inaugural Disk, for example, drew 6,619 matches on "personal" and 78,741 on "computer," and found 1,136 documents containing both. Access time on an average of three trials was 101.39 seconds. Average access time on the more complex query "personal computer and cd-rom and high sierra and microsoft and sony and ms-dos" resulted in one document match after 207.97 seconds.

Secondary to the all-important Query command are Copy and Print (after all the searching, you need a place for the information). Any document may be marked or tagged for printing or copying to an ASCII file on a hard or floppy disk. Output can be specified to include an identifying slug or remark, title, plus text and character tags based on the highlighted query-matched words. Included are the options to print and copy complete matched documents or portions of those documents where matches occur—not quite cut and paste, but close enough.

SOME LIMITATIONS It's understandable that *Computer Library's* editorial content of the full-text documents have a number of typos, considering that the full-

Microsoft Bookshelf

Would you pay a thousand dollars to connect your PC to ten well-intentioned but uninspired electronic reference works? That's the dilemma facing would-be purchasers of *Microsoft Bookshelf*.

You spend \$295 plus the price of a CD-ROM drive, then nearly \$1,000 for an almanac, ZIP code directory, thesaurus, dictionary, spell checker, *Bartlett's Familiar Quotations*, and four other works that succeed better in concept than in practice. The almanac is superficial and dated, you can't trust the ZIP code directory, and *Bartlett's* is weak on useful quotes of our lifetime. For that much money, you have the right to ask, "Why not the best?"

Bookshelf runs on its own or in the background with a dozen popular word processors (but not yet with *WordPerfect 5.0*). When you need to look up information, you can trigger *Bookshelf* and find the information (if *Bookshelf* has it) faster than you could with printed reference works, then paste the information (up to 50 lines at a time) into your document.

Here's what *Bookshelf* comprises:

■ *The American Heritage Dictionary*.



FACT FILE

Microsoft Bookshelf

Microsoft Corp.
16011 N.E. 36th Way
Redmond, WA 98073-9717
(206) 882-8080
List Price: \$295

Requires: 512K RAM (256K to run stand-alone), DOS 3.1. RAMdisk recommended.
In Short: Almanac, ZIP code directory, dictionary, spell checker, thesaurus, quotations, style manual, usage checker, business forms and letters, and business information sources on a single CD disk. Probably too expensive for casual users, certainly too superficial for serious business users. Some data is 4 to 5 years out of date now.

CIRCLE 678 ON READER SERVICE CARD

Words and their meanings (but no illustrations), plus brief facts on famous names and places.

■ *Houghton Mifflin Spelling Verifier and Corrector*. A spell-checker, separate from the dictionary.

■ *Roger's II: Electronic Thesaurus*. Synonyms, no antonyms. Also separate from the dictionary.

■ *The 1987 Newspaper Enterprise Association World Almanac and Book of Facts*, prepared in 1986.

■ *Bartlett's Familiar Quotations*. 22,500 quotations, last updated in 1980.

■ *The Chicago Manual of Style*, 13th edition. A writer's guide to style and formatting questions.

■ Commonly used business forms and letters.

■ *The U.S. ZIP code directory*. You supply the address, *Bookshelf* supplies the five-digit ZIP code.

■ *Houghton Mifflin Usage Alert*. Proper usage of commonly misused words, such as *its* and *it's*.

■ *Business Information Sources*. The where and how of finding business-related information (government agencies, industry groups, publications), not the information itself.

The dictionary, thesaurus, spell checker, word usage, and ZIP code directory allow quick lookup of phrases on the screen. Most ingenious is the ZIP code lookup, which can paste a ZIP code onto the on-

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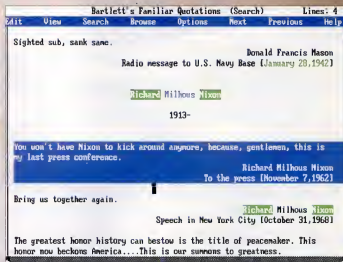
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Bartlett's Familiar Quotations is one of ten reference works included in Microsoft Bookshelf; others include a dictionary, spell checker, almanac, business sources and forms, and style guide. Most of these references are interesting but lightweight, lacking the depth needed by serious researchers.



screen address. Too bad it's not the right ZIP code: Of ten addresses chosen at random, *Bookshelf* couldn't find (or found the wrong ZIP for) three.

The dictionary is capable, though *Webster's Third New International Dictionary* or *Webster's New World Dictionary of the American Language* are considered more authoritative. While the spell checker and thesaurus are adequate, most word processors have one or both now.

Are *Bartlett's* 22,500 familiar quotations enough? Not if you're interested in the quotations of this century. Did Groucho Marx say more than two memorable lines in his lifetime? Not according to *Bartlett's*. Wasn't it the former Senator Everett Dirksen who quipped that if you spend a billion here and a billion there, it starts to add up? You'll never know: *Bartlett's* offers neither that quote nor anything else by Dirksen.

Business Information Sources is passable but dated. Want to learn more about PCs? Only five of the 29 recommended books on computers were published since the birth of the IBM PC.

And almanacs are fine if you're mildly curious, superficial if you're a serious re-

searcher. One example: While the government tracks inflation rates back to 1913, *Bookshelf's* almanac covers only the years 1979-84.

SCREEN WOES *Bookshelf* can't display more than 80 characters by 25 lines, even though EGA and VGA displays are

■ Better buffering of Microsoft Bookshelf's data would vastly improve its speed.

capable of more. You can scroll sideways through wide tables, but anyone who's used a PC knows it's easier to move your eye across a 132-column screen or print-out. *Bookshelf* can be painfully slow to move up or down a screen; better buffering of data would vastly improve the perceived speed.

Bookshelf isn't all bad news. The abili-

ty to quickly find and display all occurrences of a phrase or quote fragment beats paper reference works hands down: A dictionary lookup of "milieu" took 4 seconds on an 8-MHz AT, finding Richard Nixon's "I'm not a crook" quote took 10 seconds in two steps, and the Consumer Price Index took 15 seconds (two steps). *Bookshelf* has adequate cross-references, though it's a long way from hypertext. You can use the dictionary as an ultimate thesaurus, looking up the definitions of other definitions. You can do limited Boolean (AND, OR) searches, and you can set bookmarks for frequently used references.

When it was released in August 1987, *Bookshelf* was the second mainstream CD-ROM application and, as such, a bit of a learning tool for Microsoft. A revised *Bookshelf* is in the works, with the second-generation (read: faster) retrieval engine of *Microsoft Programmer's Library*, and there's talk of additional reference works. Finding room won't be a problem: *Bookshelf* uses only 150 of the 660MB available.

Microsoft needs to reject the notion that half a loaf multiplied by 10 equates to an electronic feast—although blame should

In 1988, \$3.5 billion in micro-computer software will be sold worldwide. During that same time, another \$3.0 billion in sales will be lost to free distribution — better known as software piracy. And right now, Rainbow Technologies' Software Sentinel™ is protecting close to \$1.0 billion in software for developers who never wanted to be part of the free software distribution network in the first place. () The Software Sentinel hardware key is "execution control" software protection. It ships with the software and simply plugs into the PC's parallel port to be one hundred percent invisible to both user and the software. Users can make as many copies as they want. Make working submasters. Use a hard disk. Virtually anything that can be done with unprotected software. Except start freely distributing that software to other users. () The Rainbow family of Software Sentinel products. Selected by the very big to the not-so-big developers of DOS, OS/2 and Xenix software in worldwide markets. To the tune of close to a billion dollars. So far.



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■ CD-ROM LIBRARIES

be assessed all around. If better reference tools were available, Microsoft would likely acquire them. For example, the shaky ZIP code directory comes directly from the post office, and other almanacs have roughly the same material and lack of depth.

Even today, in a business setting, *Bookshelf* has enough merit that you might consider hanging a *Bookshelf*-dedicated CD-ROM reader on your network. Potential standalone users (freelance writers, academics) will find *Bookshelf*'s value much more problematic.—Bill Howard

Microsoft Programmer's Library

Microsoft has focused on the legions of corporate programmers with *Microsoft Programmer's Library*, a compendium of 48 reference works on one CD-ROM disk. This \$395 package offers easy access to a collection of books, technical references, and over 7MB of sample code covering Microsoft's programming language and operating system offerings.

Part of a new library of CD-ROM products, all of which use the MS Library re-

trieval software, the *Programmer's Library* disk is in High Sierra format and can be used with any CD-ROM drive that supports the Microsoft CD-ROM extensions.

Although MS Library is presently customized to each particular CD-ROM release from Microsoft, all future CD-ROM selections from the company (including the recent releases of *Microsoft Stat Pack* and *Microsoft Small Business Consultant*) will let you load and unload different CD-ROM disks using the same version of MS Library retrieval software. This is a handy feature indeed.

Installed as either a resident or nonresident program, the retrieval software uses a *Windows*-like pull-down menu/dialog box user interface. When installed resident, it requires approximately 135K RAM, or 70K if LIM 3.2-compatible expanded memory is available.

NINE LIBRARIES The 48 reference works contained in *Microsoft Programmer's Library* are grouped into nine individual libraries: C Language, OS/2, *Windows*, MASM, MS-DOS, BASIC, Hardware, Pascal, and FORTRAN (see the sidebar "Inside Microsoft Programmer's Library" for a complete list). These



FACT FILE

Microsoft Programmer's Library

Microsoft Corp.
16011 NE 36th Way
Redmond, WA 98073-9717
(206) 882-8080

List Price: \$395

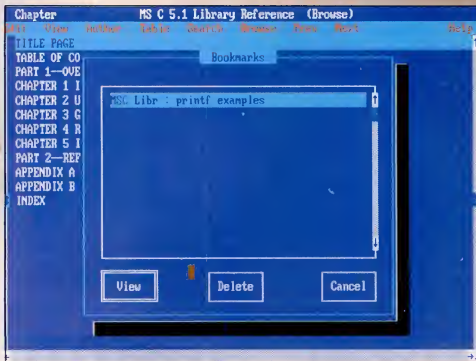
Requires: 640K RAM, DOS 3.1 or later.
Hard disk recommended.

In Short: This compendium of 48 reference works covers Microsoft's programming language and operating system offerings grouped into nine libraries. Not priced for the everyday consumer, but a real productivity booster for the corporate programmer.

CIRCLE 673 ON READER SERVICE CARD

libraries are accessed one at a time: you first select the library and then a specific reference within it. The software defaults to the library last used. With such grouping, the package unfortunately includes no option to search all references within a library—such as all the references within the C library—and no option to search all the available libraries at once.

Within a reference, at least, the *Programmer's Library* search function dem-



Accessing Microsoft Programmer's Library files is usually done through a hierarchical system of menu choices roughly corresponding to a table of contents in which you narrow the search parameters. Setting a bookmark, however, will save time by taking you directly to a specified reference within the library.

INSIDE MICROSOFT PROGRAMMER'S LIBRARY

The following is a list of reference works, plus over 7MB of sample code, that were included in *Microsoft Programmer's Library* at press time:

C References *

- Microsoft C 5.1 Update
- Microsoft C 5.1 User's Guide
- Microsoft C 5.1 Language Reference
- Microsoft C 5.1 Run-Time Library Reference
- Microsoft C 5.1 QuickC Programmer's Guide
- Proficient C, by Augie Hansen
- C Language Sample Code

OS/2 References

- MS OS/2 Setup Guide
- MS OS/2 Beginning User's Guide
- MS OS/2 User's Reference
- MS OS/2 Programmer's Learning Guide
- MS OS/2 Programming Tools
- MS OS/2 Programmer's Reference
- MS OS/2 Device Drivers Guide
- MS OS/2 Device Drivers Update
- Inside OS/2, by Gordon Letwin
- OS/2 Sample Code

Windows References

- Microsoft Windows 2.0 Getting Started
- Microsoft Windows 2.0 Application Style Guide
- Microsoft Windows 2.0 Program-

- mer's Reference
- Microsoft Windows 2.0 Programmer's Learning Guide
- Microsoft Windows 2.0 Programming Tools
- Microsoft Windows 2.0 Adaptation Guide
- Microsoft Windows 2.0 Extensions
- Microsoft Windows 2.0 CodeView Update
- Programming Windows, by Charles Petzold
- Windows Sample Code

MASM References *

- MASM 5.1 5.1 Update
- MASM 5.1 Programmer's Guide
- MASM 5.1 Reference
- MASM 5.1 Sample Code

MS-DOS References

- MS-DOS 3.3 Programmer's Reference
- The MS-DOS Encyclopedia
- Advanced MS-DOS, by Ray Duncan
- MS-DOS Sample Code

BASIC References *

- Microsoft BASIC 6.0 User's Guide
- Microsoft QuickBASIC Programming in BASIC
- Microsoft QuickBASIC Learning and Using Microsoft QuickBASIC
- Microsoft QuickBASIC BASIC Language Reference

BASIC Language Sample Code

Hardware References

- Microsoft Mouse Programmer's Reference Guide
- Microsoft MS-DOS CD-ROM Extensions
- Programmer's Guide to PC and PS/2 Video Systems, by Richard Wilton
- Hardware Sample Code

Pascal References *

- Microsoft Pascal Compiler 4.0 Update
- Microsoft Pascal Compiler 4.0 User's Guide
- Microsoft Pascal Compiler 4.0 Reference Manual
- Pascal Language Sample Code

FORTRAN References *

- Microsoft FORTRAN 4.1 Update
- Microsoft FORTRAN 4.1 Language Reference
- Microsoft FORTRAN 4.1 User's Guide
- FORTRAN Language Sample Code

* These libraries also include the following documentation:

- CodeView/Utilities Manual
- CodeView/Utilities Manual Update
- Microsoft Mixed-Language Programming Guide
- Microsoft Editor User's Guide

onstrates its power. To search for a phrase, you enter it into any of three "term boxes." Terms entered into separate term boxes are ANDed—that is, a match is found only if the terms in all term boxes are found. (A comma entered between phrases in a term box represents an OR.) You also select the proximity level, specifying that a search succeed if a match is found within a chapter, within a section, within a subsection, or within a paragraph. As far as speed is concerned, I timed a search for the printf function in the MSC 5.1 Users Guide on an 8-MHz IBM AT, and it took 23 seconds to produce 27 matches.

Unfortunately, you cannot yet access the OS/2 libraries (or any others) while running OS/2. As of this writing Microsoft

is working on a device driver to allow access to *Programmer's Library* from within the DOS compatibility box. But until it's finished, the *Programmer's Library* runs only under DOS.

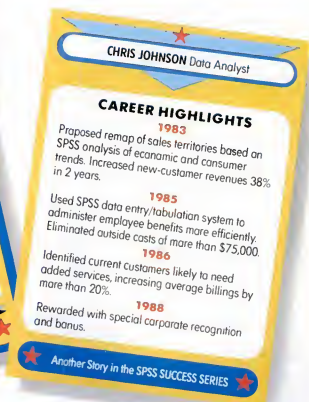
FOR FUTURE REFERENCE You can save your position within a reference for later retrieval using the *Programmer's Library* bookmark feature. You can, for example, enter a bookmark for the printf function section in the MSC 5.1 Library Reference Manual. Then, whenever you need information on printf, you just select the bookmark; the software automatically loads the appropriate reference at the saved position within the text. This can be extremely helpful for frequently used refer-

ences, and as many as 80 bookmarks can be saved.

Another feature, the clipboard, lets you mark a block of text or sample code, copy it, and then paste the clipboard contents into one of 14 supported text editors and word processors. (My text editor worked fine even though it's not listed). The clipboard contents can also be saved to a file but cannot be printed directly from within the library software. And while the size of the clipboard is limited only by available hard disk space, you can only add to the clipboard in increments of up to 200 lines at a time.

When you add the cost of a CD-ROM drive, approximately \$800, to the *Programmer's Library* \$395 price, the total

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■ CD-ROM LIBRARIES

approaches \$1,200—not for the everyday consumer. But *Microsoft Programmer's Library* can be a real productivity booster, especially if you're loath to leave your workstation. And while those of us with a finger on the future hope for a more hyper-text-like interface to all this information, those of us with real work to do can now take advantage of its benefits.

—Salvatore P. Ricciardi

The New Electronic Encyclopedia

Early in 1986, Grolier Electronic Publishing became the first company to release a mass-market CD-ROM disk when it introduced *The Electronic Encyclopedia*, a CD-ROM version of the *Academic American Encyclopedia*. Grolier's latest release, *The New Electronic Encyclopedia*, offers a spanking-new retrieval interface by Online Computer Systems and greater access to the print version's 21 volumes of information.

One look at the printed encyclopedia may prompt a question: why were the *Academic American's* wealth of illustrations left off a disk filled to a fraction of its total

capacity? The answer, however, is hardly an oversight: the product's primary market, the library, is not ordinarily equipped with the video capabilities required to display graphics images. And at \$395, the disk costs less than half the list price of the print version.

You won't miss the graphics: more than 30,690 articles, replete with cross-references to related subjects, can be summoned in up to ten windows at a time. Bibliographies, "factboxes" (summaries), outlines, and tables are included as well.

GETTING STARTED Installing *The New Electronic Encyclopedia* is easier than it may seem from the documentation. The product does not require the Microsoft CD-ROM extensions, but if you've installed them, that's fine, too—the retrieval software's installation will modify its own EE.BAT file to suit your existing configuration.

The manual, though brief, runs you through the basic setup and explains the program's versatile search methods. A glossary, command summary, and list of 158 stop words—e.g. prepositions, single letters, and linking verbs, which are ignored as search criteria—are included.



FACT FILE

The New Electronic Encyclopedia

Grolier Electronic Publishing
Sherman Turnpike
Danbury, CT 06816
(203) 797-3500

List Price: \$395

Requires: 512K RAM, DOS 3.0 or later.

In Short: Grolier's *Academic American Encyclopedia* minus graphics offers a slick retrieval interface from Online Computer Systems to access more than 30,000 articles on a variety of subjects. A few design quirks, but a valuable aid to student research.

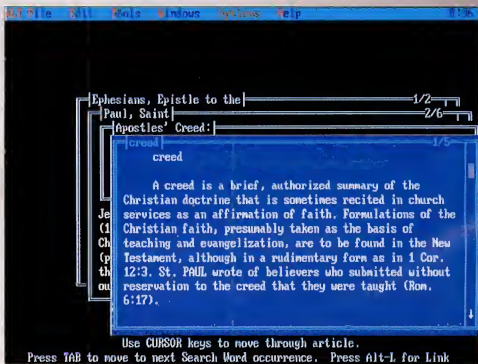
CIRCLE 67 ON READER SERVICE CARD

Also evident is the company's wish to assume the role of electronic librarian: the manual's discussion on search techniques warns the end user (primarily students from grade 6 through college) to quote freely but never, never to plagiarize—an easy temptation when you can save anything to disk.

At the start of a search, highlighting Word Search lets you determine which articles on the disk include a word or phrase. Searches generously allow * and ? wild-



Uppercase words in *The New Electronic Encyclopedia's* entries are "linked" words, which can summon a cross-referenced menu of titles at the touch of a key. The pop-up menus accessed via the upper screen's bar menu can be bypassed with several Alt-key combinations.





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cards, plus any combination of AND, OR, and NOT that you'd need. If a search yields more than 50 titles, a message will pop up to suggest you narrow your search.

There are limitations, however. Once you've viewed the first on your list of articles, there's no quick advance to the next article; you must backtrack to the list. And if you've found 20 articles that satisfy your search criteria, the titles of only 10 at a time reside in RAM; a disk read is expected when you're calling up an article, but tedious when you want just five more titles. Searches are reasonably quick but indicative of how far CD-ROM technology still must improve: a complex search for both articles containing the phrases "New Testament" OR "Letters of Paul" AND "Ephesians" but NOT "Love," for instance, took 19 seconds to complete on an 8-MHz AT, plus 3 seconds to call up the first article.

DISPLAYING TEXT Once displayed, an article can be displayed full-screen or in windows sized to accommodate other windows. Search words or phrases are highlighted throughout the text (Tab takes you to the next occurrence), and uppercase words indicate the presence of an article linked to the original entry; hit Enter with the cursor over one of these words, and a window with the related article pops up with additional information.

Text can be saved onto your floppy or hard disk—one paragraph, page, or article at a time—or printed through a straight ASCII dump. But if all you want to do is mark your place and return to it later, the Bookmark Feature is what you want. Bookmark places are stored in the Notepad, a handy SideKick-like window whose contents can be saved on disk.

Whenever the next version of *The New Electronic Encyclopedia* ("The Newer," perhaps) is released, its retrieval software is expected to offer the mouse support that's noticeably absent from the Alt-key and windowing interface. And the occasional unclear prompt displayed during such routines as marking text should be smoothed over as well. But if you're looking for a good research tool, don't let the product's quirks sway you: *The New Electronic Encyclopedia* is well worth a look.

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When you look up the definition of "knowledge" in the printed *OED*, you can find dozens of quotations that contain that word. But what of the thousands of quotations listed under different phrases that contain the word "knowledge"? The printed edition offers no way to find them; the compact-disk version offers that and more.

12 ORIGINAL VOLUMES The *Original Oxford English Dictionary on Compact Disk*, issued by Oxford University Press and Tri Star Publishing at \$950, contains the 12 original volumes of the *OED* as

published between 1884 and 1928, packed onto one 645MB disk. It omits the four-volume supplement published in 1972-86 and lacks even the interim one-volume supplement of 1933. Oxford is now combining the original *OED* and the new Supplement in a *New OED* to be published in book form in 1989—and presumably in electronic form sometime later.

Meanwhile, this first CD version permits unprecedented access to the original *OED*. You can search for any word (or, by using Boolean operators, groups of words) in the quotations, etymologies, or definitions. You can search for words with usage labels like "billiards" or "Australian," or narrow the search by author, work, year, or range of years. You could find every word cited from Dickens with a definition that uses the word "city" or "town," and wild cards let you search for all words that begin with "declar*" or "independ*."

By combining search terms, you can search for every quotation in the *OED* that dates from 1776 and includes the word "America" (there are 17). If you ask for all citations that include both "love" and "death," you can see the first in about 8 seconds. While you read the first, the program searches in the background for an-



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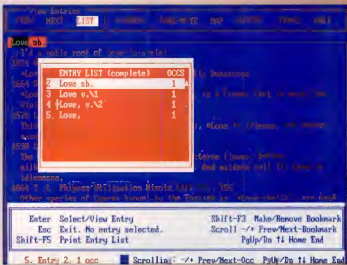
CIRCLE #94 ON READER SERVICE CARD

other 2 minutes and finds 50 more. If you want to find every citation from Shakespeare that includes the word "love," you'll have to wait a bit longer.

If you use an EGA or VGA monitor, the CD version can display about 850 of the special characters used in the printed text, and a pop-up list lets you incorporate any of them in a search string. On monochrome and CGA monitors, an abbreviat-



The *Original Oxford English Dictionary* on Compact Disk displays definitions, quotations, phrases, etc., in different colors that correspond to different type styles in the printed text. You can switch to other words located in the same search from a point-and-shoot menu.



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ed name for the character appears between European angle-brackets instead of the character itself, so you see "facUcdil-fade" instead of "façade." Formulas, musical printing, non-Latin-based alphabets, and tabular material do not appear at all in the CD; they are represented only by a starburst symbol that appears correctly placed only in the printed book.

Tri Star's retrieval software is generally robust and fairly easy to use. You can enter search terms into a query window either by typing them directly or by using a menu. You can transfer search strings from an index of labels, authors, or works and store about 300 queries for use at a later date. A pop-up notepad is available when you're reading an entry, along with 70 screens of context-sensitive help. With the use of a

■ The 12 original volumes of the *OED* are packed onto one 645MB compact disk.

color monitor you can distinguish easily among etymologies, definitions, and quotations.

Early copies of the CD version split the alphabet between two disks. Oxford fixed this absurd arrangement by changing to the higher-capacity ISO 9660 format and by adding some entries to the lists of "noise words" that are unindexed in quotations and definitions.

The printed *OED* is far more efficient than the CD if you merely want to look up a word. The CD version lets you find a definition in 5 seconds, but because you can only see one screen of text at once, it isn't easy to find the exact shade of meaning you need. For complex entries, some of them filling dozens of screens, the CD displays a "structure map" of the numbered sections in the definition, but the map displays only the numbers—and it doesn't help to be able to jump to section 33 of a definition if you have no idea what section 33 contains.

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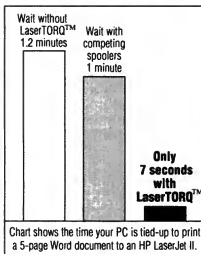
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printed *OED*, it serves as an indispensable—and enjoyable—index to the printed book. Every research library needs the CD, and hundreds of scholars are probably hard at work writing grant applications in the hope of being able to afford a copy.
—Edward Mendelson

Reader's Guide to Periodical Literature

If information acquisition is part of your daily routine, the \$1,095 yearly subscription cost for the H. W. Wilson Company's *Reader's Guide to Periodical Literature* CD-ROM will be no obstacle to you at all. The very worst it will do for you is keep you out of musty library basements, while at best it can answer most of your "Where did I see that?" and "Where can I find that?" questions.

The installation software is not as imposing as the standard Microsoft CD-ROM extensions. Wilson, in fact, does not use the Microsoft extensions and currently does not provide a driver for the Sony CMU6100 that was used as the standard reader for these reviews (they do support the CMU100B). Luckily a Philips CM121

was available, and Wilson's driver for the CM100 worked fine with it (Wilson supports either the 153 or 155 controller card for this reader).

Installation will take you all of about 15 minutes; it does nothing more than set up the directories and drives you'll be using and transfer the retrieval software to your hard disk.

STRATEGIES VARY There are two variations on retrieval strategies. One is a simple browse routine based on a single, general subject-recall parameter. If your search yields no direct matches, you'll be given a list of possibilities that fall into the range of topics you might have actually meant.

Searching for the subject "O'Brien, Bill," for instance, will place you in the middle of a list of O'Briens at that entry or as close to "Bill" as possible if there is no direct match. From there the normal PC direction keys can move you up or down through the list—which, at its extremes, includes every subject in the database.

The other search strategy, Wilsearch, lets you become more specific by defining any or all of three subject lines, author and journal names, the article title, and even a



FACT FILE

Reader's Guide to Periodical Literature

H.W. Wilson
Bronx, NY 10452
(212) 588-8998

List Price: \$1,095

Requires: 640K RAM, hard disk, DOS 3.1 or later.

In Short: Ideal reference source for schools, libraries, and researchers even though the package does not currently support the Microsoft CD-ROM extensions. Retrieval software is quite manageable, and the flexibility of the WilSearch query mode lets you enter complex search parameters.

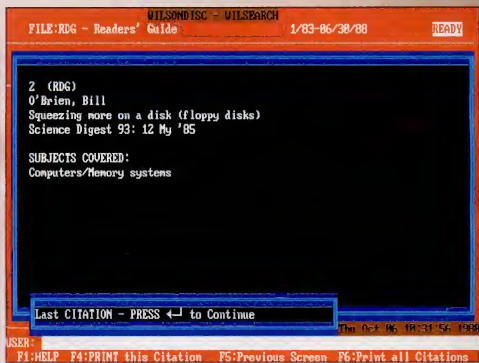
CIRCLE 672 ON READER SERVICE CARD

Dewey number if you have one. Using this method, only those records that directly match your search parameters are reported. Search response times were generally quick; Wilson seems to have developed a good retrieval algorithm. Most searches, despite their complexity, took under 20 seconds.

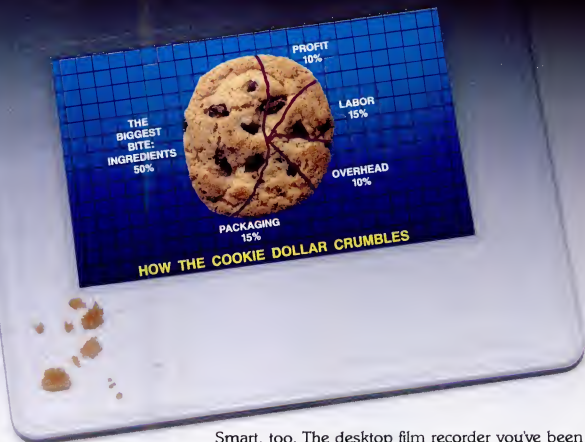
There did, at first, appear to be some limitations to the package's output capability. Printing is the only obvious output



Wilson's Wilsearch retrieval software for the *Reader's Guide to Periodical Literature* attempts to emulate a windowing environment. Rather than using pull-down menus, Wilsearch enlists function-key commands for paging, printing, and help requests. The screen is customizable for a variety of video systems.



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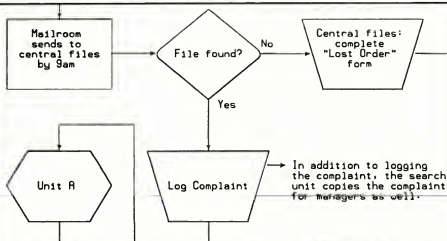
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choice, and no commands are apparent for saving a list of citations to disk. A little devious work in the setup file cured that by changing the output port from LPT1: to a disk filename. Wilson must have had this in mind, because new entries into the file do not overwrite old ones—they're added to the end. In any case, the output is straight ASCII, which means that PostScript or other DCL printers will need a little assistance.

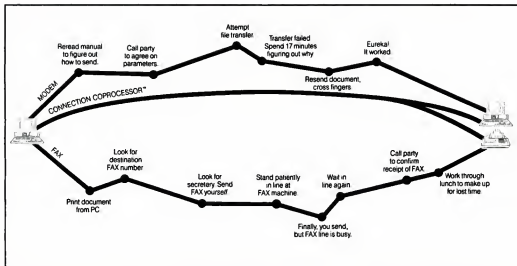
One excellent tie-in that Wilson furnishes (at additional cost) is an adjunct on-line search of its own database. While the company does send you quarterly updates

■ In its version of the *Reader's Guide to Periodical Literature*, Wilson seems to have developed a good retrieval algorithm.

(via new disks) throughout your subscription year (the CD covers a 4½-year period), interim additions are maintained on Wilson's own computer. Once you're established as an on-line customer, if your search turns up no response locally or you suspect that newer citations may exist, a single keystroke automatically logs into the company's mainframe, does the search, and downloads the response.

Periodical literature may not sound like the most interesting of topics, and by many standards it most likely isn't. The CD comes without any abstracts—only citations that tell you where to find the information you want. It serves solely as a pointer that lets your legs pick up the trail. But put one of these in a library (even a school library) or in the middle of a research department, and it will justify its cost in a few months. And if periodical literature isn't your forte, Wilson also has CDs or on-line services covering the arts, sciences, books, and a host of other topics.—Bill O'Brien

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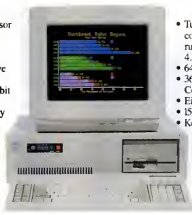
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CIRCLE 742 ON READER SERVICE CARD

■ UTILITIES ■ MICHAEL J. MEFFORD

ANSI.SYS WITHOUT THE HASSLE

The ANSI control sequences open up fascinating opportunities for screen display and DOS function-key reassignments. Here's how to implement them without loading ANSI.SYS.

Would you like to control screen colors with a simple TYPE command? Wouldn't it be nice to redefine your function keys to do meaningful work in DOS? ANSI.COM, this issue's utility, is designed to give you that control without incurring the performance penalties involved in using IBM's own ANSI.SYS to do the job.

ANSI.SYS is a DOS device driver that provides extended screen and keyboard control to any application that uses DOS functions for its input or output. Like other device drivers, it's installed at boot time from the CONFIG.SYS file, and the small divot of memory it carves out can't be recovered after it is installed. Since ANSI looks for its control sequences by examining each character both when it comes in from the keyboard and when it is output to the screen, performance can suffer. The effect is negligible on the performance of fast machines, though it is noticeable with slower processors.

The ANSI driver gives access to the ANSI functions only to programs that use DOS services for I/O. For performance reasons, most of today's regular applications circumvent DOS I/O, either by using the BIOS or addressing the hardware directly. (If you don't have ANSI.SYS installed, you'll know right away whether a particular program requires it, because a telltale series of escape codes will be strewn across the screen.)

The program that all of us use that can profit from ANSI, however, is COMMAND.COM. You might not have thought of COMMAND.COM as a pro-

gram, but it is, and the most common way to make use of ANSI control is through COMMAND.COM's PROMPT command. With ANSI's aid, the dull white on black A> prompt can become a colorful and more informative command-awaiting screen. The seldom-used DOS function keys (F3 is normally the only useful one)

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How to utilize the ANSI control sequences without loading ANSI.SYS.

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Simplify the task of dealing with OS/2's complex new interface.

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OS/2 equivalents of GETENV.ASM and changing times and dates to ASCII.

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IBM BASIC won't run on PC clones; the PC AT battery's important rolc.

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Find out which networks use NetBIOS and how LAN Manager works with it.

can be defined to type out things you have to enter frequently, such as DIR, TYPE, and COPY.

ANSI.COM is a memory-resident utility that can be installed or uninstalled at any time. The utility performs all the functions of ANSI.SYS, but it adds the abilities to work at higher screen speed, to be activated or deactivated at will, to use a large-size, flushable key-reassignment buffer, and to work with video modes of any width or length—including the 43-line EGA mode.

GETTING A COPY OF ANSI You can download a ready-to-run copy of ANSI.COM from PC MagNet, as explained in the sidebar "ANSI by Modem." The source code, ANSI.ASM, together with ANSI.BAS (a BASIC listing that will automatically produce ANSI.COM when you run it) is printed here; however, both are also available for downloading from PC MagNet.

When entered initially, either at the DOS prompt or as part of your AUTOEXEC.BAT file, ANSI installs itself like any other TSR. Since it makes no sense to install a duplicate console driver, however, ANSI.COM will not install if ANSI.SYS is already loaded. If you are presently using ANSI.SYS, therefore, remove the statement DEVICE=ANSI.SYS from your CONFIG.SYS file, add ANSI.COM to your AUTOEXEC.BAT, and reboot your machine.

The full ANSI.COM syntax is

ANSI [FAST | SLOW] [ON | OFF] [/B nnn] [/C] [/U]

memory ANSI reserves for key assignments. The *nnn* parameter is the decimal number of the desired buffer size in bytes. By default, ANSI.COM reserves the same size buffer—200 bytes—as does ANSI.SYS. If you've found yourself restricted by the limited buffer of ANSI.SYS, you'll appreciate the 60K maximum assignable under ANSI.COM. Alternatively, if you don't plan to reassign any keys, you can set the buffer size to 0. Selecting a zero buffer shrinks ANSI.COM down to its minimum residence size, a little under 2K. Since the memory buffer must be allocated at load time, you can only use the /B switch when you are installing the ANSI program.

[illegible]

(continues)

■ UTILITIES

THE IBM ANSI COMMAND SET

The ANSI.SYS device driver is mentioned in the DEVICE command section of the regular DOS Reference manual. The command set is not included there, however, and is found instead in the *Technical Reference* manual (called the *Command Reference* for DOS 4.0). Since many readers do not have the *Technical Reference* manual, the ANSI command set is listed here.

CONTROL SEQUENCE SYNTAX

The control sequences have the following general form:

ESC[parametersCOMMAND

The ESC is not the three-character sequence *E-S-C* but rather the 1-byte ASCII code for decimal 27 (hex 1B). The left bracket is the second control character and is followed by the parameters for the specific ANSI command. The parameters in the IBM ANSI-supported commands listed below are either a decimal number, represented by #, or a literal string, designated by beginning and ending matching single or double quotation marks. To include a quote within a string, use the other kind of quote as the delimiter. For example, "This" is a single quote or "This" is a double quote.

A semicolon is used to separate multiple parameters. If a parameter value is omitted or specified as 0, then the default parameter is used for the command. The COMMAND is the last character(s) in the sequence. In all but a few cases the COMMAND is constituted by a single, case-sensitive alpha character.

CURSOR CONTROL SEQUENCES

In all cursor-control commands, the parameters are checked to keep the cursor within the boundaries of the screen. That is, you cannot move the cursor offscreen. The default value of 1 is used for any omitted parameters.

Cursor Position

ESC[# ; # H

or the alternative sequence

ESC[# ; # f

Either of these sequences moves the cursor to the row that is specified by the first parameter and to the column that is specified by the second. One or both of the parameters may be omitted. For example, ESC[; 5H is equivalent to ESC[1 ; 5H, and the cursor would be moved to the first row, column 5. If both parameters

are omitted, then the cursor is moved to the home position.

Cursor Up

ESC[# A

The sequence above moves the cursor up # rows without changing its column position.

Cursor Down

ESC[# B

This sequence moves the cursor down by # rows without changing its column position.

Cursor Forward

ESC[# C

This sequence moves the cursor forward # columns without changing its row.

Cursor Backward

ESC[# D

The above sequence moves the cursor backward by # columns without changing its row.

Cursor Position Report

ESC[# ; # R

The sequence above reports the row and column of the cursor through the standard input device. The ESC[6n sequence (Device Status Report) outputs the position report. Most applications will find the Device Status Report of no use to them. The DOS prompt will become uncontrolled if you use it as part of a PROMPT command.

Save Cursor Position

ESC[s

This sequence saves the current cursor position so that it can be restored later.

Restore Cursor Position

ESC[u



SGR Parameters

Parameter	Attribute
0	All attributes off (normal white on black)
1	Bold on (high intensity)
4	Underline for monochrome display; blue foreground for color
5	Blink on
7	Reverse video on
8	Canceled on (invisible)
30	Black foreground
31	Red foreground
32	Green foreground
33	Yellow foreground
34	Underline for monochrome display; blue foreground for color
35	Magenta foreground
36	Cyan foreground
37	White foreground
40	Black background
41	Red background
42	Green background
43	Yellow background
44	Blue background
45	Magenta background
46	Cyan background
47	White background

Figure A: The color and attribute parameters of the IBM ANSI Set Graphics Rendition control sequence.

This sequence restores the cursor to the position saved with the last Save Cursor Position sequence.

ERASING CONTROL SEQUENCES

Erase in Display or CLS

ESC[2J

This sequence clears the screen with the current SGR (Set Graphics Rendition) attribute (see below) and moves the cursor to the home (top-left) position.

Erase in Line

ESC[K

The sequence shown above erases the line containing the cursor from (and including) the current cursor position. It uses the SGR attribute from the current cursor position.



Video Modes

Parameter	Video mode or action
0	40x25 black and white
1	40x25 color
2	80x25 black and white
3	80x25 color
4	320x200 color
5	320x200 black and white
6	640x200 black and white
7	Wrap at end of line (typing past end of line wraps to new line)
14	640x200 color EGA
15	640x350 mono EGA
16	640x350 color EGA
17	640x480 color VGA
18	640x480 color VGA
19	320x200 color VGA

Figure B: The video modes supported by the IBM ANSI Set Mode control sequence.



Extended ASCII Codes

Extended ASCII code	Meaning or key(s)
3	NUL (null character)
15	Shift-Tab
16-25	Alt-Q, -W, -E, -R, -T, -Y, -U, -I, -O, and -P
30-38	Alt-Z, -X, -C, -V, -B, -M, and -N
59-68	F1 through F10
71	Home
72	Cursor Up
73	PgUp
75	Cursor Left
77	Cursor Right
79	End
80	Cursor Down
81	PgDn
82	Ins
83	Del
84-93	F11 through F20 (Shift-F1 through -F10)
94-103	F20 through F30 (Ctrl-F1 through -F10)

Figure C: The extended ASCII codes used in the 2-byte ANSI key redefinitions.

Set Graphics Rendition

ESC[# ; . . . ; #m

This sequence selects the attribute used to display characters. Attributes have a cumulative effect. For example, ESC[31;5:43m would make the attribute red on yellow and blink.

To undo this, you first change the attribute back to normal and then reset the color. For example, ESC[0;34;47m would first change any predefined attribute to normal (effectively canceling any bold or blink attribute) and change the display attribute to blue on white. A listing of the SGR parameters and their definitions are shown in Figure A, "SGR Parameters."

Set Mode

ESC[=#h

This sequence changes the video mode to #, where # has one of the values shown in Figure B, "Video Modes." Note: the mode options numbered 14 through 19 were added to the IBM subset with DOS 4.0. (ANSI.COM supports the added modes with any DOS version if your system supports them.) Chances are that you won't find much use for this or the following Reset Mode command.

Reset Mode

ESC[#1

Note that the command character is a lowercase l, not the numeral 1. All the parameters are the same as those shown in the "Video Mode" table, except that a parameter 7 turns line wrap off (the cursor does not wrap to the next line).

KEY REASSIGNMENT The sequences used to reassign the keyboard keys is one of the more useful functions of the ANSI expanded control system. They are as follows:

```
ESC[ # ; . . . #p
or ESC["string"p
or ESC['string"p
or ESC[;"string";#;"string";#p
or any combination of the above
```

The first # is the ASCII character code for the key to be reassigned. It's followed by a single or string of codes that are to replace it. If the first parameter is 0, then the first and second parameters make up an extended ASCII code, and the third parameter (instead of the second) becomes the first reassignment ASCII character. For example,

```
ESC[0;68;"Dir";13p
```

causes a directory listing to be produced when the F10 key (extended code 0;68) is pressed. Replacement characters can also have extended codes. Figure C, "Extended ASCII Codes," lists these codes.—Michael J. Jefford

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C> FILE NOT FOUND!

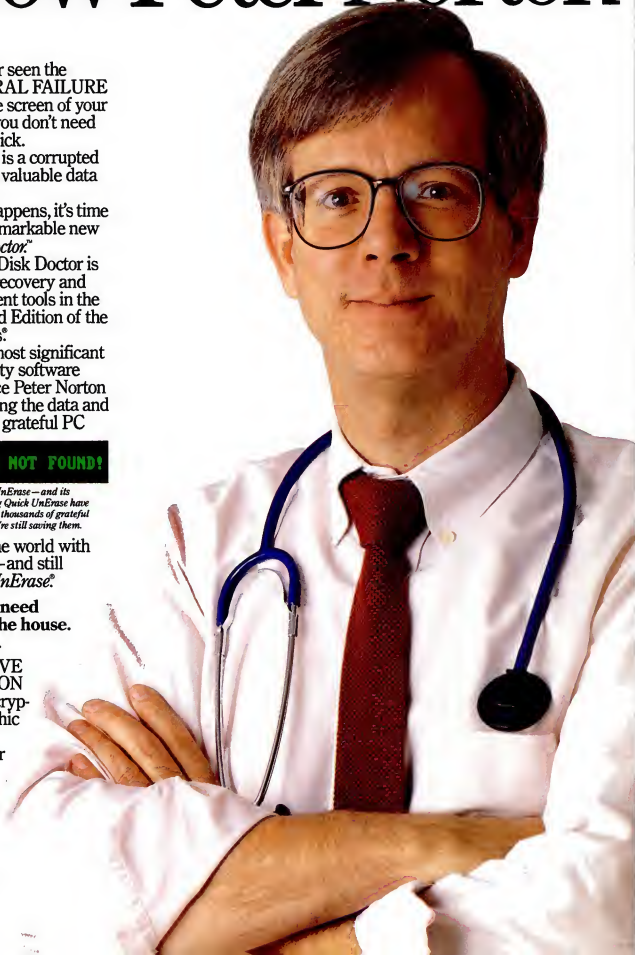
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■ UTILITIES

```

      MOV CX,COMMAND_LENGTH ;Number of commands.
      REPTN SCANS ;Check for a match.
      JNE FLUSH_BUFFER ;If no match, flush sequence.
      INC RUMBER_COUNT ;$ism, increment for last number.
      MOV DI,OFFSET COMMAND_END ;Point to appropriate command
      JNE PROCEDURE ;Proceed to procedure.
      SUB DI,CX ;Get cursor position data.
      CALL GET_SIOS_DATA ;do command subroutine.
      CALL DS:[DI] ;Clear buffer.
      JMP SHORT FLUSH_END

;-----
QUOTE_STATE: CWP AL,QUOTE_TYPE ;Is it an ending string quote?
             JNE SUPPER_CMA ;If no, buffer literal.
             MOV RS,OFFSET PARAM_STATE ;$isla, back to parameter parsing.
             JMP SHORT PARAM_STATE

;-----
STORE_STATE: MOV ANSI_STATE,RS ;Store the ANSI state.

;-----
SUPPER_CHAR: MOV DI,ESC_COUNT ;Buffer the character in case
             CWP DI,ESC_BUFFER_SIZE ;ending ANSI command is illegal.
             JE FLUSH_BUFFER ;If buffer full, flush.
             ADD DI,OFFSET ESC_BUFFER ;Point to next buffer position.
             STORES ;Store the character.
             INC ESC_COUNT ;Increment the sequence count.
             RET

;-----
FLUSH_BUFFER: PUSHA ;Save the current character.
             MOV AX,OFFSET ESC_BUFFER ;Point to the sequence buffer.
             MOV CX,ESC_COUNT ;Count of buffered characters.
             NEXT_FLUSH: LODSB ;Retrieve one.
             PUSHA ;Save counter and pointer.
             MOV SI,WRITE_CHAR ;Write character to screen.
             POP CX ;Restore counter and pointer.
             LOOP NEXT_FLUSH ;Flush entire buffer.
             MOV AX ;Flush last character.
             CALL WRITE_CHAR ;Write it also.
             MOV ESC_COUNT,0 ;Reset counter.
             MOV ANSI_STATE,OFFSET ESC_STATE ;Back to Esc state.
             MOV RUMBER_COUNT,0 ;Reset parameter counter.
             PUSHA ;Point to our data.
             MOV CX ;Clear number buffer
             MOV DI,OFFSET RUMBER_BUFFER ;to zero.
             MOV CX,ESC_BUFFER_SIZE / 2
             XOR AX,AX
             REP STOSB
             RET

;-----
; $isla video writes are via SIOS WTT.
;-----
WRITE_CHAR: MOV DI,OFFSET FORMAT_CHARS ;Is SIOS process carriage
             MOV CX,FORMAT_LENGTH ;return, linefeed, backspace
             REPTN ;and bell via
             WRITE_TTY ;TTY.
             CALL GET_SIOS_DATA ;Get SIOS video data.
             CWP AL,5 ;character + TAB?
             JNE CR_ACTIVE ;If no, process normally.
             MOV CX,CURSOR_POSN ;$isla, expand TAB to
             AND CX,7 ;appropriate space characters.
             ADD CX,8
             NEXT_TAB: PUSHA ;Save data segment.
                     MOV AL,SPACE ;Point to SIOS data.
                     CALL CR_ACTIVE
                     POP CX
                     LOOP NEXT_TAB
                     RET

;-----
CR_ACTIVE: TEST STATUS_OFF ;Is ANSI OFF?
           JNE WRITE_TTY ;If yes, write via SIOS TTY.
           CALL CR_RLW_TTY ;Is ANSI CLM or in graphics
           JNC WRITE_PAST ;mode? if no, write fast.

;-----
WRITE_FLOW: PUSHA ;$isla, write character/attribute
           MOV CX,1 ;at current cursor position
           MOV BN,ACTIVE_PAGE ;via SIOS.
           MOV RS,ATTRIBUTE
           MOV AN,9
           INT 10H
           POP AX
           CWP LINE_WRAP_ON ;Is line wrap on?
           JE TTY ;If yes, continue.
           MOV CX,CRT_COLS ;$isla, cursor at rightmost
           DEC CL ;column)
           CWP CL,CURSOR_COL ;If yes, continue, else
           JNE TTY ;return without writing.
           RET

;-----
TTY: MOV AN,$20 ;Attribute in graphics mode.
      INT 10H
      RET

;-----
; Past screen writes are directly to the video buffer without retrance check.
;-----
WRITE_PAST: PUSHA ;Preserve active segment.
           MOV DI,CURSOR_POSN ;Retrieve cursor position.
           CALL VIDEO_SETUP ;Calculate video address.
           MOV AN,ATTRIBUTE ;Retrieve attribute.
           CALL CHAR_ATTRIB ;Get char/attrib in video buffer.
           INC DL ;Increment cursor column.
           CWP DL,BYTE PTR CRT_COLS ;End of $isla video buffer.
           JNE UPDATE_CURSOR ;If no, update cursor.
           CWP LINE_WRAP_ON ;$isla, line wrap off?
           JE PAST_END ;If yes, don't write cursor.
           MOV DL,0 ;$isla, column zero.
           INC DL ;Next row.
           CALL INFORMATION ;Get displayable row info.
           CWP DH,AL ;Beyond the bottom of screen)

;-----
JNE UPDATE_CURSOR ;If no, update cursor.
DEC DB ;$isla, cursor to original row.
MOV SI,DI ;Point destination to top.
MOV AX,CRT_COLS ;Point source to second row
PUSHA ;by adding width in columns
ADD AX,SI ;twice for char/attribute.
MOV DI,AX
MOV CX,AX ;Times displayable rows - 1.
MOV DX,DI ;equals char/attrib to scroll.
PUSHA ;Save data segment and
PUSHA ;point to video segment.
POP DS
POP DS
POP DS ;Scroll the screen.
POP DS ;Restore data segment.
POP DS ;Retrieve CRT column.
MOV AL,SPACE ;Write space/attrib to
MOV AH,ATTRIBUTE ;bottom row.
REP STOSB

UPDATE_CURSOR: CALL SET_CURSOR ;Update the cursor position.
              POP ES ;Restore entire segment.
              RET

;-----
;***** SUPPORT ROUTINES *****
;-----
CR_QUOTE: MOV RS,OFFSET QUOTE_STATE ;Assume quote state.
          MOV AX,DOUBLE_QUOTES
          CWP AL,AN
          JE JOT_QUOTE ;Is it double quote?
          MOV AX,STRING_QUOTES ;Is it a string quote?
          CWP AL,AN ;Is it a string delimiter.
          JNE QUOTE_END ;If not, return 2H = 0.
          MOV MOVMO_TYPE,AN ;Store as matching string end.
          QUOTE_END: RET

;-----
ACCURULATE: PUSHA ;Preserve number character.
            MOV AL,"0" ;Convert ASCII to binary.
            MOV AX,18 ;Multiply previous count by 10.
            MOV RS,RUMBER_COUNT
            MOV DI,OFFSET RUMBER_BUFFER[AX]
            MOV AX,CL ;Add in new number
            POP AX ;end store.
            RET

;-----
; OUTPUT: CT = 1 if write SIOS mode or in graphics mode; CT = 0 otherwise.
;-----
CR_FLOW_TTY: MOV STATUS_TTY ;$isla
             JNE SIOS_MODE
             CWP CRT_ROWS,7
             JE TEXT_MODE
             CWP CRT_COLS,1
             JA TEXT_ROWS
             RET

;-----
TEXT_ROWS: CLC
           RET

;-----
SIOS_MODE: STC
           RET

;-----
; OUTPUT: AL = Screen rows minus one
;-----
INFORMATION: PUSHA ;Save data segment.
            MOV AX,40 ;Point to SIOS data.
            MOV DS,AX
            MOV AL,DS:[40H]
            OR AL,AL ;Retrieve rows - 1.
            JNE INFO_END ;SIOS supported?
            MOV AX,24 ;If yes, done here.
            POP DS ;$isla, assume 25 lines.
            RET

;-----
; INPUT: DS = Cursor position
; OUTPUT: ES = Video buffer segment; DI = Video buffer offset; AX,DX preserved
;-----
VIDEO_SETUP: PUSHA ;Save data segment.
            MOV AX,CRT_COLS ;Retrieve CRT columns.
            MOV DH ;$isla cursor row.
            MOV BL,DL
            MOV AX,0
            MOV AX,AX ;Plus cursor column.
            MOV AX,1 ;$isla, cursor at rightmost
            MOV DI,CRT_START ;Plus starting video offset.
            ADD DI,AX ;equals destination.
            MOV SI,$8000 ;Assume mono card.
            MOV DI,$8000,364H ;Is it mono port?
            MOV DI,VIDEO_SEGMENT ;Is yes, queued right.
            MOV RS,AX ;$isla, point to color segment.
            MOV AX
            RET

;-----
; Move SIOS video data into our data segment.
;-----
GET_SIOS_DATA: PUSHA ;Save data segment.
              MOV DI ;Point to SIOS data segment.
              MOV RS,40H
              MOV DS,AX
              MOV DI,SIOS_ACTIVE_PAGE ;Start with active page.
              MOV DI,OFFSET ACTIVE_PAGE
              MOVSI ;Retrieve active page
              MOVSI ;and address of 64K port.
              MOV CX,CRT_DATA_LENGTH ;CRT length, CRT start.
              REP MOVSB
              MOV DI,SIOS_ACTIVE_PAGE ;Use active page as index
              XOR BX,BX ;of active cursor position.
              AND SI,BX
              MOVSI

```

(ANSI.ASM continues)

(ANSI/ASM continues)

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(ANSI ASM continues)



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```

CR_U:      CMP     AL,"U"           ;Is it "U" ?
           JE      DO_U            ;if yes, try to uninstall.
           JMP     NEXT_PARA       ;if no, next parameter.
DO_U:      CALL    CR_INSTALLED    ;else, see if installed.
           JZ      DX_OFFSET_NOT_INSTALLED ;if no, exit with error message.
           JS      LILLY_PAD       ;too far for short jump.
           JMP     UNINSTALL       ;else, uninstall.

;-----
;INSTALL:
;CALL    CR_INSTALLED             ;display status.
;JS      CR_AVAILABLE            ;check if already installed.
;OR      AL,AL                    ;if no, enough memory.
;JMP     EXIT                     ;if no, done.
;Exit with ERRORLEVEL = 0.

;-----
; This is the install procedure.
;-----
CR_AVAILABLE: MOV     BP,OFFSET REASSIGNMENT_BUFFER ;75H ends at end
ADD     BP,15                      ; of reassignment buffer.
ADD     BP,15                      ; Round up.
CMP     BP,0x14                    ; Buffer > 256 bytes in segment?
MOV     DX,OFFSET NOT_ENOUGH      ; if yes, exit without installing
JA      MSG_EXIT                   ; with message.

MOV     AX,3529H                   ;get undocumented INT 25 vector.
INT     21H
MOV     SI,OFFSET COM              ;Does it point to ANSI.SYS?
MOV     DI,COM_OFFSET             ;Check by looking for "COM"
MOV     CX,3                       ; 1 as device name
CWD
REP     SCASB                     ;Exit with error message if
;ANSI.SYS loaded.
LILLY_PAD: JE      DX_OFFSET ANSI_SYS_ERR

MOV     OLD_INT_25(8),BX           ;else save old interrupt.
MOV     OLD_INT_25(2),BX
MOV     DX,OFFSET ANSI_INT_25     ;install new interrupt.
INT     21H
MOV     AX,3516H                   ;get INT 16 vector.
INT     21H
MOV     OLD_INT_16(8),BX           ;save old interrupt.
MOV     OLD_INT_16(2),BX
MOV     DX,OFFSET ANSI_INT_16     ;install new interrupt.
INT     21H
MOV     AX,3516H                   ;get DOS 21h interrupt.
INT     21H
MOV     OLD_INT_21(8),BX           ;save old interrupt.
MOV     OLD_INT_21(2),BX
MOV     DX,OFFSET ANSI_INT_21     ;install new interrupt.
INT     21H
MOV     AX,0x12CB                 ;get environment segment.
MOV     BX,AX
MOV     AX,49H                    ;Free up environment.
INT     21H

MOV     DX,OFFSET INSTALL_MSG     ;display install message.
CALL    PRINT_STRING              ;set up the number buffer.
MOV     DI,0                       ;retrieve resident byte request.
MOV     CX,4                       ;convert to paragraphs.
MOV     DX,CX                      ;return error code if err.
MOV     AX,3199H                   ;terminate but stay resident.
INT     21H

;-----
; Exit. Return ERRORLEVEL code 0 if successful, 1 if unsuccessful.
;-----
MSG_EXIT:  CALL    PRINT_STRING    ;ERRORLEVEL = 1.
          MOV     AL,1             ;terminate.
          MOV     AX,4CH
          INT     21H

;-----
; This subroutine uninstalls the resident ANSI.COM.
;-----
UNINSTALL: AND     ES,STATUS,NOT ON ;turn off ANSI, just in case
OR      ES,STATUS,OFF             ; can't uninstall.
MOV     CX,ES                      ;save segment in CX.
MOV     AX,3529H                   ;get interrupt 29h.
INT     21H
CMP     DX,OFFSET ANSI_INT_29     ;has it been hooked by another?
JNE     UNINSTALL_ERR             ;if yes, exit with error message.
MOV     BX,ES                      ;is the segment vector same?
CMP     BX,CX                      ;if no, exit with error message.
JNE     UNINSTALL_ERR             ;get interrupt 16h.
MOV     AX,3516H
INT     21H
CMP     DX,OFFSET ANSI_INT_16     ;has it been hooked by another?
JNE     UNINSTALL_ERR             ;if yes, exit with error message.
MOV     BX,ES                      ;is the segment vector same?
CMP     BX,CX                      ;if no, exit with error message.
JNE     UNINSTALL_ERR             ;get interrupt 21h.
MOV     AX,3516H
INT     21H
CMP     DX,OFFSET ANSI_INT_21     ;has it been hooked by another?
JNE     UNINSTALL_ERR             ;if yes, exit with error message.
MOV     BX,ES                      ;is the segment vector same?
CMP     BX,CX                      ;if no, exit with error message.
JNE     UNINSTALL_ERR             ;return memory to system pool.
MOV     AX,49H
INT     21H
MOV     DX,OFFSET ALLOCATE_MSG    ;display message if problem.
JC      MSG_EXIT
MOV     DX,ES:OLD_INT_29(8)       ;restore old INT 29.
MOV     DX,ES:OLD_INT_29(2)
MOV     AX,3529H
INT     21H
MOV     DX,ES:OLD_INT_16(8)       ;restore old INT 16.
MOV     DX,ES:OLD_INT_16(2)

```

(ANSI.ASM continues)

instead stands for the control character, decimal 27, hex 1B. ESC is among the 32 characters in the ASCII table that appear before the first text character (the space, character 32). These initial characters are known as control characters because they are used to control devices. ESC is Ctrl-[, which is often printed as `[`. The ASCII display interpretation is a small left arrow.

Entering the ESC character itself is always the hardest part of issuing an escape sequence, so I'll discuss ways to do it.

The DOS PROMPT command provides the easiest way to send ANSI escape commands to the console. PROMPT has a subset of commands all its own, called metastrings. A metastring consists of two characters, a `$` followed by the command character. These are usually used to set a prompt that's quite independent of ANSI. (The DOS manual contains a complete listing of PROMPT metastrings.) The `$e` metastring generates the ESC character (27), however, and so can be used to introduce an ANSI control sequence. With ANSI.COM (or ANSI.SYS) loaded, a PROMPT command that would keep the

screen clear is

PROMPT \$e[2J

Note that while PROMPT metastrings are not case-sensitive, the actual ANSI commands are. In the above example the `e` in

■ PROMPT provides the easiest way to send ANSI escape commands to the console. PROMPT has a subset of commands called metastrings.

`$e` could be upper- or lowercase, but the ANSI `J` command must have a capital `J`.

In this example, the ANSI escape sequence is issued with every new DOS prompt. There are times when it's unne-

cessary to continually send the same escape sequence. Changing the ANSI display attribute is one example of this, since you want the attribute to stay in effect until it is changed. To accomplish this, TYPEing a file that consists of an ANSI command to the console is a better idea. For example, to change the screen output to white characters on a blue background, you create a short file that consists of the sequence

ESC[37;34m

Again, the ESC must be the escape character, but how do you get an ESC character into a text file?

Readers who follow this column regularly will recall that we recently (November 15, 1988) published a utility by Tom Kihlken, called TED. TED is perfect for making this kind of short file, as it lets you simply hit the Esc key to generate the ESC character. If you haven't got this utility, however, you need another way.

In most word processors, pressing the Esc key alone won't do. Most word processors will let you enter control characters, but you must first signal your inten-

<pre> MOV AX,2510h INT 21h MOV DX,ES:OLD_INT_21[0] MOV DS,ES:OLD_INT_21[2] MOV AX,2521h INT 21h PUSH DS POP DS MOV DX,OFFSET UNINSTALL_MSG CALL PRINT_STRING OR AL,AL JMP EXIT UNINSTALL_MSG: MOV SB,CX CALL STATUS_REPORT MOV DX,OFFSET UNLOAD_MSG JMP MSG_EXIT INITIALIZE ENDP </pre>	<pre> ;Restore old INT 21. ;Display "Status: ". ;Display "Status: ". ;Display appropriate ON or OFF, ; SLOW or FAST. ;Print character via DOS. ;Print string via DOS. </pre>
<pre> ;----- ; INPUT: SI points to parameter start. ; OUTPUT: SI points to parameter end; BX = number. ;----- DECIMAL_INPUT PROC XOR BX,BX LODSB CMP AL,CH JZ ADJUST_DEC CMP AL,7 JB ADJUST_DEC SUB AL,"0" JC NEXT_DECIMAL CMP AL,7 JA NEXT_DECIMAL CWD KCBW MOV CX,10 HLT CX JC DECIMAL_ERROR ADD BX,AX JNC NEXT_DECIMAL SUB BX,1 ADJUST_DEC DEC RET DECIMAL_INPUT ENDP </pre>	<pre> ;----- ; INPUT: SI points to parameter start. ; OUTPUT: SI points to parameter end; BX = number. ;----- DECIMAL_INPUT PROC XOR BX,BX LODSB CMP AL,CH JZ ADJUST_DEC CMP AL,7 JB ADJUST_DEC SUB AL,"0" JC NEXT_DECIMAL CMP AL,7 JA NEXT_DECIMAL CWD KCBW MOV CX,10 HLT CX JC DECIMAL_ERROR ADD BX,AX JNC NEXT_DECIMAL SUB BX,1 ADJUST_DEC DEC RET DECIMAL_INPUT ENDP </pre>
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(ANSI.ASM ends)

tions to the program. In *WordStar* and *SideKick*, for example, you first hold down the Ctrl key, press P, and then press the Esc key. A ^ [will appear on the screen. You must now add ANSI's "regular" left bracket and the command parameters. For the white on blue attribute above, the complete sequence appears as ^ [37;34m. Don't be confused by the pair of left brackets. The ESC represented is characterized by ^ [, and the second character in the escape sequence is a left bracket. Once you've entered the sequence, save it to a file named BLUE, for example, and enter the command TYPE BLUE. Nothing from the file will appear on the screen. ANSI has absorbed the string as a command, however, and all subsequent screen output, including the next prompt, will be white on blue. Enter CLS and the whole screen will clear to blue.

If you have trouble getting your favorite word processor to accept the ESC character, everyone has at least one program that will do the job: EDLIN. To create the same white-on-blue file, start EDLIN by entering EDLIN BLUE. Then at the asterisk prompt press I to insert a line. To enter the starting ESC in EDLIN, you press Ctrl-V

and then the left bracket, [. Then enter the "normal" left bracket, again followed by the desired command parameters. The EDLIN screen display in this case will be

```
1* ^V[37;34m
```

```

A
MOV     SI,0000
MOV     CL,[SI]
XOR     CH,CH
INC     CX
MOV     Word Ptr [SI],5B1B
LODSB
INT     29
LOOP    010C
RET

```

```

N ESCAPE.COM
RCX
12
W
Q

```

Figure 1: This short program solves the problem of entering escape sequences at the DOS prompt. After DEBUG is loaded, these commands send the ESC, bracket, and command string to ANSI.

Now hit Enter to insert the line. Ctrl-Break to stop inserting, and E to end and save the editing session. The result will be the BLUE file with the escape sequence. (Note, do not try to enter the ESC code by typing the caret character followed by a capital V. It won't work. Instead, press and hold the Ctrl key and then press V.)

Still a third way to enter escape sequences—and one of the easiest when you're experimenting with escape commands—is to enter them directly at the DOS prompt. The problem is that it's almost impossible to do. If you try to start an escape sequence by pressing the Esc key at the DOS prompt, DOS interprets the key-press as a command to abort the current process and spits out a confusing backslash character, \. You never get the chance to add the [that starts the ANSI sequence. Trying to trick DOS by using the numeric keypad technique of holding down the Alt key and entering 27 results in the same DOS abort reaction.

To solve the problem, I've included a short program here that will send both the ESC, the bracket, and then the command string to ANSI. To create the program, you must load DEBUG and enter the com-

■ UTILITIES

mands that are shown in Figure 1

With this short program, you can change the attribute to white on blue, for example, by entering `ESCAPE 37;34m`. The `ESCAPE.COM` program will take care of the ESC-plus-bracket combination.

All you have to do is add the ANSI command parameters.

Before turning to the technical side of ANSI.COM, however, I do want to share with you a couple of my favorite ANSI command sequences, starting with the fol-

lowing date and time display:

```
PROMPT $e[n$e|;50H$d $t$h$h$h$h$h$h$h$h$e|u$P$g
```

This sequence uses a combination of the DOS PROMPT and ANSI cursor control. It saves the cursor position, moves the cur-

[illegible]

1129	DATA	74	RE	20	D3	73	22	D3	88	AF	67	8	88	16	AA	838
1130	DATA	74	RE	20	D3	73	22	D3	88	AF	67	8	88	16	AA	838
1131	DATA	74	RE	20	D3	73	12	84	49	EF	77	FF	88	52	AA	838
1132	DATA	74	RE	20	D3	73	12	84	49	EF	77	FF	88	52	AA	838
1133	DATA	74	RE	20	D3	73	12	84	49	EF	77	FF	88	52	AA	838
1134	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1135	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1136	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1137	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1138	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1139	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1140	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1141	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1142	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1143	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1144	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1145	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1146	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1147	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1148	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1149	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1150	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1151	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1152	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1153	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1154	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1155	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1156	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1157	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1158	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1159	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1160	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1161	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1162	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1163	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1164	DATA	6	FD	1	2	C	6	E	6	75	FF	C3	88	16	FF	1
1165	DATA	6	FD	1	2	C										

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sor to the top right of the screen, and displays the date, a few delimiting spaces, and the time. PROMPT's \$h destructive backspace metastring then erases the distracting second, and hundredth second places from the time display, after which the cursor is returned to the saved position where the current drive and directory are displayed, followed by the familiar greater-than-sign prompt. Note that the time will be updated only when you generate a new prompt.

Another favorite sequence that I use on my own machine is

```
PROMPT $p -$g $e[8m $e[0m$e[D
```

This sequence displays the current drive and directory, followed by a space, and a directing combination of an equals sign and a greater-than sign as the prompt. Since I hate a blinking cursor, the next part of the sequence changes the attribute to invisible (\$e[8m) and displays a space. The

attribute is then returned to a normal white on black (\$e[0m)—use a color of your liking here—and the cursor is moved backward one column to the invisible space. The result is an invisible blinking cursor at an idle prompt. Of course as soon as you start to type a command, the cursor moves on to a space with a normal attribute and becomes visible again.

UNDOCUMENTED DOS CALL DOS calls on the undocumented INT 29h for all its screen output. If you trace through the INT 29 interrupt handler (without ANSI.SYS or ANSI.COM loaded), you'll find a very short procedure that makes a BIOS INT 10. Write TTY 0Eh function call. The BIOS Write TTY (teletype) is an all-purpose screen output function that takes care of updating the cursor position. It includes line wrap and even scrolls the screen when the cursor wraps on the last line. Since it's ANSI's job to filter all DOS

output, all that ANSI has to do to accomplish its mission is steal the INT 29. ANSI thus gets a chance to look through all DOS output for its ESC-[combination.

The one sticky part about the escape sequence is that the alpha command character doesn't come until the end of the string. That means ANSI has to buffer all potential escape sequences (the tip, of course, is the starting ESC-[) until it gets the ending command character. If the command is invalid, the buffer is flushed to the screen. Otherwise, the string never makes it to the screen and ANSI takes the appropriate command-requested action. You probably noticed that in the ESCAPE.COM program above the escape string is passed directly to ANSI.COM via an INT 29 call.

A STATE MACHINE The escape sequence structure provides a perfect opportunity for ANSI to implement what is called a state-machine technique. A state

Webster's defines form as ...

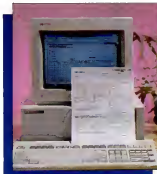
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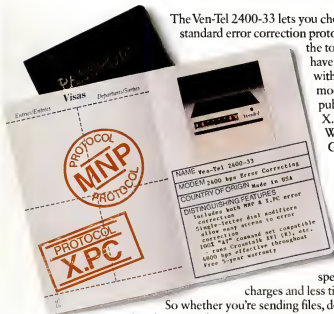
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Michael J. Mefford

Purpose:

A memory-resident utility that enables selectable use of the extended screen and keyboard control sequences that normally require loading the ANSI.SYS device driver. Unlike ANSI.SYS, ANSI.COM supports all video modes, permits sizing and clearing the key-assignment buffer, and provides high-speed screen updating.

Format:

ANSI [FAST | SLOW] [ON | OFF] [/B *nnn*] [/C] [/U]

Remarks:

ANSI.COM may be installed either at the DOS prompt or through an AUTOEXEC.BAT file. It will not load itself if ANSI.SYS has already been loaded as part of a CONFIG.SYS file. ANSI.COM will not load multiple copies of itself, so its command name may be invoked repeatedly in the same session to change user-selectable parameters.

Upon loading, ANSI defaults to the FAST and ON status parameters. For use with IBM CGA video cards (where direct screen writes produce "snow") or with some screen capture software, the SLOW (screen writing via the BIOS, as with ANSI.SYS) status option may be selected. Entering ANSI OFF disables recognition of the ANSI control codes.

The ANSI.COM key-assignment buffer defaults to a size of 200 bytes. The buffer may be increased to 60K or decreased to 0 bytes by entering ANSI with the /B switch and the desired number of bytes as *nnn*. Resizing the buffer after initial installation requires uninstallation, which may be accomplished using the /U switch. Current key assignments are lost if the buffer is resized. The buffer can be cleared without resizing by invoking ANSI with the /C switch.

The full command set of IBM-ANSI control sequences is printed in the original article and in the DOS *Technical Reference* manual. This information can also be downloaded from PC MagNet.

Available for downloading from PC MagNet (see the "ANSI by Modem" sidebar), ANSI.COM is already compiled and ready to run. Running ANSI.BAS once in BASIC will automatically create ANSI.COM. To create ANSI.COM from the ANSI.ASM source code requires use of a macro assembler (IBM or Microsoft, Version 2 or later) and the following commands:

```

MASH ANSI;
LINK ANSI;
EXE2BIN ANSI ANSI.COM;

```

ANSI
Command

1989 No. 2 (Utilities)

■ UTILITIES

machine jumps to a procedure according to a particular stage in a sequence of events. For ANSI, the command syntax dictates what ANSI is to expect next. In the first stage, ANSI jumps directly to a short procedure that checks for the ESC character, passing all others through to the display. Once the ESC is detected, ANSI's interest is piqued, and on the next DOS INT 29 call, it can skip the ESC monitor and branch directly to a procedure that looks for the left bracket. If the left bracket is found, on subsequent calls ANSI goes directly to the third number-parameter-parsing procedure, which converts decimal numbers to binary. The parameter stage can go into a substage of its own if either a single or double quote is encountered. (The quote stage buffers string characters as literals until a closing matching quote is encountered, which kicks ANSI back to the parsing stage.)

If any stage is not satisfied—if, for ex-

ample, the left bracket is not the second character or the command is invalid—the buffer is flushed and ANSI reverts to the first ESC-monitoring stage. The state ma-

■ For ANSI, the command syntax dictates what ANSI is to expect next.

chine technique makes for more efficient processing by avoiding unnecessary branching.

THE SPECIAL CASE OF CLS Normally DOS processes the DOS Clear Screen command with its own internal CON de-

vice handler. If DOS finds that the INT 29h vector does not point to the same segment as the kernel, DOS knows someone else has hooked the vector and assumes it is ANSI.SYS. If DOS thinks ANSI.SYS is installed, it passes the CLS job on to the driver by sending INT 29 an ESC[2J (Erase in Display) string. This is so that ANSI.SYS can clear the screen with any user-chosen attribute. That means ANSI.COM will receive an ESC[2J whenever you enter CLS. This would seem to be no problem since ANSI is already geared up for the task. You could, however, assign ANSI an OFF status even while it's still installed. In the OFF state, ANSI is supposed to pass all characters on to the screen, but you would certainly be disappointed if the ESC[2J were echoed to the screen instead of its clearing the screen. The ANSI program, therefore, provides a special state so that it can process the ESC[2J string even when ANSI is OFF.



When ANSI is OFF, the screen is cleared, but with a normal white on black instead of with the assigned attribute.

CHECKING THE INPUT DOS INT 29 makes filtering output escape sequences a breeze. Filtering input from the keyboard for key reassignment is a little trickier for ANSI. The DOS keyboard input calls are INT 21 functions 1, 6, 7, and Ah. These four DOS input functions serve only as a middleman, and they end up calling the BIOS INT 16 to do the actual work of retrieving keystrokes from the keyboard buffer. DOS adds little to the process other than overhead, which is why most programs are written to go directly to the BIOS INT 16 for key input. For those programs that *do* use DOS, however, ANSI must monitor the keyboard throughput. This is accomplished by hooking both the INT 21 and INT 16 interrupts.

The chain of events then goes some-

thing like this: A program like COMMAND.COM calls INT 21, function Ah (Buffered Keyboard Input) for a keystroke. Since ANSI has hooked INT 21, it

■ Filtering input from the keyboard for key reassignment is a little bit tricky for ANSI.

gets called in the process and sets a flag if the function is one of the four key-input functions before it passes control on to the original (DOS) INT 21 handler. DOS gets control and calls INT 16 for the keystroke. Since ANSI has hooked INT 16 also, the call ends up in ANSI's lap again. ANSI

sees that the flag has been set by the ANSI INT 21 handler, so after it calls on INT 16 to get a keystroke, it checks the returned key against its reassignment buffer. If a match is found, the reassigned string is passed back, a byte at a time. For any INT 16 calls that have not been called by DOS, the flag will not have been set, so ANSI passes the call on to the real INT 16 handler untouched.

ENCLOSING The .ASM listing for ANSI.COM is amply documented and will repay inspection by present and prospective assembly language programmers. For all PC users, however, if you didn't use ANSI before because it wasn't flexible enough, you've run out of excuses not to experiment with extended screen and keyboard control. □

Michael J. Mefford is a contributing editor of PC Magazine.

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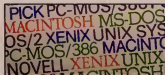
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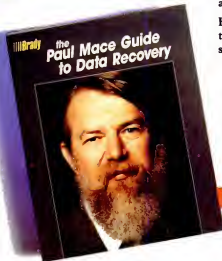
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■ ENVIRONMENTS ■ CHARLES PETZOLD

SPEAKING THE LANGUAGE OF THE PM API, PART 1



Understanding the object-oriented language and the consistent programming rules of the Presentation Manager will help simplify the task of dealing with a very complex new interface.

Five-hundred function calls. That's what the Presentation Manager adds to OS/2. Without a doubt, that adds up to a large, deep, complex system.

The sheer bulk of the functions makes a first encounter with the Presentation Manager API (application program interface) difficult enough. What makes things worse is that the API goes well beyond function calls: PM programs seem to be written in a strange language—one full of unfamiliar words, new variable types, uppercase identifiers, and many novel data structures.

Programming for the Presentation Manager really requires that you learn a new language to use within a more traditional programming language such as C. Fortunately this "PM language" has been designed in a very consistent and structured manner. Beneath its initially confusing appearance lie some very sound design principles. Once you decode the PM language, you may conclude that despite its size, the Presentation Manager has one of the cleanest and most elegant APIs ever designed. In fact, the OS/2 kernel API seems chaotic and disorganized by comparison!

In last issue's column I discussed how concepts derived from object-oriented programming have made their way into the architecture of the Presentation Manager. As we'll see, the language of PM—in particular, the syntax of its functions—evokes the same object-oriented flavor.

Let's begin our look at the language spoken by PM programs with an aspect that may at first glance seem trivial: the ac-

tual names of the functions that the Presentation Manager uses.

THE FUNCTION NAME PREFIX The Presentation Manager adds about 500 operating-system function calls to OS/2. Each is given a name, which you use within a program just as you use the names of standard library functions, such as the `Cstrlen` and `fopen` functions.

As in the OS/2 kernel, PM function names begin with a three-letter prefix that identifies the general category to which the function belongs. The OS/2 kernel functions have prefixes of `Dos`, `Vio` (video I/O), `Kbd` (keyboard), and `Mou` (mouse).

The Presentation Manager adds five new function name prefixes. The great majority of the new functions in the Presentation Manager have prefixes of `Win` or `Gpi`. These correspond to the two major components of the Presentation Manager: the windowing and user interface compo-

nent, and the Graphics Programming Interface (Gpi). With but few exceptions, the `Win` functions are part of `PMWIN.DLL` and the `Gpi` functions are part of `PMGPI.DLL`, which are thus two of the largest dynamic link libraries found in the Presentation Manager.

The other three new prefixes are `Spl` (print spooler functions), `Dev` (output device functions), and `Pic` (graphics picture functions). These functions are used much less frequently than `Win` and `Gpi`.

Actually, there are more than these five new prefixes in the PM, but the others are used mostly for internal purposes and are not documented for use by applications. For example, to draw on its window, a program makes calls to `Gpi` functions. For graphics drawing the Presentation Manager internally makes use of a system called the "graphics engine." The graphics engine is in the `PMGRE.DLL` library and has function names with a `Gre` prefix.

MIXED CASE FUNCTION NAMES

Following the three-letter prefix, Presentation Manager function names consist of one or more words that are written in a mixed upper/lowercase style, with minimal use of abbreviation. The names are thus generally easy to read and tell you clearly what the function does. Function names can be as short as `GpiMove` and `GpiLine` or as long as `GpiQuerySegmentTransformMatrix` and `GpiDeleteElementsBetweenLabels`.

Languages that cannot support such lengthy function names will use abbreviations instead. In some cases, abbreviations

■ Once you decode the PM language, you may conclude that despite its size, it has one of the cleanest and most elegant APIs ever designed.

■ ENVIRONMENTS

are used in the standard names, but in a very consistent manner. For example, the PM has a collection of functions that retrieve or send messages. The word "message" is abbreviated to *Msg*, as in *WinGetMsg*, *WinPeekMsg*, *WinSendMsg*, *WinPostMsg*, and *WinDispatchMsg*.

I don't have problems typing these function names, but then again, typing is what I do for a living. If you'd prefer typing the names in all lowercase or uppercase, you can do so even in a C program. C is normally case-sensitive, but the Microsoft C, Version 5.1, compiler supports a compiler switch (-Zc) that makes the names of functions using the Pascal calling sequence case-insensitive. All the OS/2 functions use the Pascal calling sequence.

THE VERB: WHAT IT DOES A verb immediately follows the three-letter prefix in most PM function-call names. (This is in turn usually followed by a noun.) We've already seen several verbs in the collection of message functions. Some of the more common verbs are Create, Set, Query, Get, Delete, Destroy, Draw, and Load. Some Presentation Manager functions with these verbs are *WinCreateWindow*, *GpiSetColor*, *GpiQueryColor*, *WinGetSysBitmap*, *GpiDeleteBitmap*, *WinDestroyWindow*, and *WinDrawBitmap*.

Function names containing the verbs Set and Query show up frequently in the Graphics Programming Interface. Of the 220 or so Gpi functions, approximately 55 are Set functions and 80 are Query functions. The Set functions often change attributes of a *presentation space*. (Conceptually, the presentation space is the surface on which a program draws.) The Query functions allow a program to determine the presentation-space attributes.

When programmers experienced with *Microsoft Windows* encounter the Presentation Manager API for the first time, they are often startled by the word *Query*. In *Windows*, the verb *Get* is used in equivalent functions. More than one *Windows* programmer has noticed the distinctive British accent of the PM API. It's no surprise to learn that much of Gpi was designed at the IBM labs in Hursley, England.

At first sight, the distinction between *Get* and *Query* may not seem very impor-

tant. But in the Presentation Manager API there is a very deliberate distinction: a *Get* function has side effects, while a *Query* function does not. This is definitely a rule to remember and to post on your wall.

For example, two common Gpi functions are *GpiSetColor* and *GpiQueryColor*. The first function sets a color index that is used for subsequent drawing. The *GpiQueryColor* function simply returns the current color index, without any side effects. This is quite different from a function like *WinGetMsg*. The latter function removes a message from a program's message queue and returns the message to the program. When *WinGetMsg* returns, the message queue contains one less message. That's a side effect.

Similarly, the *WinGetPS* function ob-

■ A verb immediately follows the three-letter prefix in most PM function-call names.

tains a handle to a "cached micro presentation space" for use by a program. This handle must later be released with a call to *WinReleasePS*. A *Query* function requires no such cleanup.

Again, the *WinGetSysBitmap* returns a handle to a copy of a system bitmap. This function has a side effect because the PM must make a copy of the bitmap for use by the program. A program should delete the bitmap (by calling *GpiDeleteBitmap*) when the bitmap is no longer needed.

On the other hand, the *WinQuerySysPointer* function returns a handle to a system pointer without making a copy of the pointer. (A "pointer" is the image on the screen that represents the mouse position.) The program does not delete the pointer. The *WinQuerySysPointer* function does have an option to create a copy of the system pointer, however, so the general rule does not hold with absolute universality.

THE HANDLE PARAMETER Following the name of the function come the

function's parameters. The first parameter of almost every Presentation Manager function is something called a *handle*. The concept of a handle is often quite confusing to the Presentation Manager newcomer, but it's really quite simple: a handle is a number that refers to an object.

Of course, you're familiar with file handles. When you open a file, OS/2 or DOS returns a file handle to your program. The handle is a number that identifies the open file to the operating system. You use this handle to read from or write to the file. When you eventually close the file, the handle becomes invalid.

In most cases a program doesn't care about the actual value of the file handle. (There are a few exceptions, for some file handles are predefined by the operating system. For example, handle 0 refers to standard input and handle 1 refers to standard output.) The operating system is able to use this handle to reference internal data it maintains on the open file, but this data is hidden from the program using the file.

The handles you use in Presentation Manager programming are quite similar. For example, one common handle is the window handle. When you create a window, the Presentation Manager returns a handle to your program. You use this handle to refer to the window in subsequent function calls that act on the window. When you eventually destroy the window, the window handle becomes invalid.

The consequence of making a handle the first parameter of every Presentation Manager function is that every PM function either acts on an object or (more precisely in some cases) causes an object to act on itself. This is what I meant earlier when I said that the very syntax of Presentation Manager functions has an object-oriented flavor.

The first parameter of most Gpi functions such as *GpiSetColor* and *GpiQueryColor* is a handle to a presentation space. (One major exception to this rule is *GpiCreatePS*, which actually creates the presentation space.) *GpiSetColor* causes a change in the object (the presentation space), and *GpiQueryColor* obtains information about the object.

Are these handles really necessary? After all, many graphics programming languages seem to get along fine without

■ ENVIRONMENTS

these seemingly superfluous handles. What could be more unambiguous than calling a function to set a color for subsequent drawing?

Yes, the presentation-space handle really is necessary, for within a program you can create multiple presentation spaces. The call to the `WinSetColor` function must indicate which presentation space the function applies to. This is the purpose of the handle.

SOME INCONSISTENCIES OF

course, there are some Presentation Manager function calls that really don't need handles because they don't act on objects. For example, the PM has a collection of functions that do some fairly simple manipulation of data structures that define rectangles. These functions have names like `GpiSetRect` and `GpiIntersectRect`.

For such cases there are two special handles that don't signify very much. These are the anchor block handle (a handle that a program obtains when it calls the `WinInitialize` function at the beginning of the program) and `HWND_DESKTOP`, a handle for the "desktop" window.

We have here one area of inconsistency in the Presentation Manager API. It's usually not obvious whether these "handle-less" functions use an anchor block handle or `HWND_DESKTOP` as the first parameter. (The rectangle functions happen to use the anchor block handle, but I had to look it up in the manual.)

Another inconsistency arises between the PM and the OS/2 kernel. There are several collections of functions in the kernel that use handles, such as functions for file I/O, file searches, device monitors, queues, and semaphores. For these functions, the handle is the first parameter.

Most of the Vio, Kbd, and Mou functions also require a handle parameter that is set to 0 in OS/2 kernel programs. In these functions, the handle is the last parameter rather than the first.

A Presentation Manager program doesn't use the OS/2 kernel Kbd and Mou functions because the PM has its own means for getting keyboard and mouse input to a program. But a PM program can use many of the Vio functions in a PM system called Advanced VIO. (Advanced VIO allows a PM program to write to its

window as if it were a character-mode device.) When these Vio functions are used in PM, the last parameter is a handle to the VIO presentation space.

Moreover, the PM includes several additional Vio functions. For consistency with the earlier Vio functions, these new functions are defined so that the handle is also the last parameter. This is definitely a blemish on the Presentation Manager API, but there's not much that can be done about it now.

OTHER FUNCTION PARAMETERS

After the first parameter of the function, there is more freedom in how other parameters are positioned. But you'll still see a lot of consistency. For example, some functions require two handles. The second handle is always the second parameter.

Sometimes functions pass a pointer to a buffer area that the function fills in with some data. This pointer is one parameter to the function. Another parameter must indicate the length of this buffer so the function

won't attempt to write beyond the end of it. The parameter that specifies the length of the buffer immediately precedes the pointer to the buffer.

Many functions have a function parameter that indicates an option of the function. I've already mentioned the `WinQuerySysPointer` function, for example. One of the parameters is set to `FALSE` (or 0) to indicate that you want a handle to a system pointer and `TRUE` (or 1) for a handle to a copy of a system pointer. This kind of option is almost always the last parameter of the function.

When you learn these basic rules, you can almost start coding PM function calls without looking them up in the manual. For example, one PM function is called `WinInvalidateRect`. It has three parameters: a window handle, a true/false option, and a pointer to a rectangle structure. How are these parameters arranged? The rules say the handle is first and the option is last. That makes the rectangle structure pointer the second parameter. Easy, right?

HEADER FILES For the C programmer, all the OS/2 kernel and Presentation Manager functions are declared in a collection of header files. The master header file is named `OS2.H`, and you include it at the top of your program:

```
#include <os2.h>
```

This file includes other header files, which then include others in the hierarchical structure. As you can see in Figure 1, the `OS2.H` header file has three `#include` statements to bring in `OS2DEF.H`, `BSE.H`, and `PM.H`. The `BSE.H` header file also has three `#include` statements to bring in `BSEDOS.H`, `BSESUB.H`, and `BSEERR.H`, and so forth. (At the time of this writing, I'm still working with a beta-test version of OS/2 1.1, so it's possible that the structure of these header files will be a little different when the new Programmer's Toolkit is released.)

The `BSE` prefix stands for "base" and indicates the base operating system—the OS/2 kernel. The `BSEDOS.H` file has declarations of the Dos functions while the `BSESUB.H` file has declarations of the Vio, Kbd, and Mou functions. The two largest OS/2 header files are `PMWIN.H` and `PMGPI.H`, which contain declarations

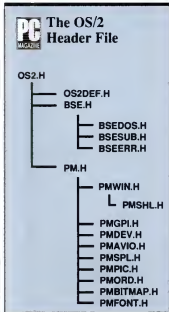


Figure 1: The `OS2.H` header file includes other header files in this hierarchical structure.

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■ ENVIRONMENTS

of most of the Win and Gpi functions.

You'll find that these header files are important in documenting the Presentation Manager API. You'll want to keep a copy near your desk or set up a file-browse program to view them on your machine.

DEFINED CONSTANTS The header files contain not only declarations of all the OS/2 functions, but also definitions of constants used with these functions.

For example, the GpiBox function draws a box. One of the function parameters specifies whether the box should be filled, outlined, or both. The parameter is set to 1, 2, or 3, respectively. But you don't have to remember which number is for which option, because the PMGPI.H header file contains #define statements to define three convenient constants for use with the function:

```
#define DRO_FILL      1L
#define DRO_OUTLINE  2L
#define DRO_OUTLINEFILL 3L
```

Using these identifiers rather than the numbers also makes your programs easier to read and understand.

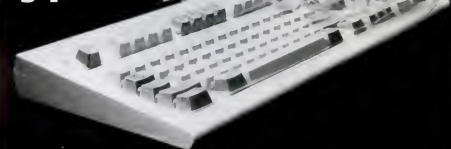
The constants defined in the header files are always typed in uppercase with an embedded underscore. Very often the prefix of the constant (the part before the underscore) is an abbreviation of the name of the function in which the constant is used. (The DRO constants are an exception to this rule, because they are used with two functions—GpiBox and GpiFullArc. DRO stands for "draw option.")

For example, the WinQuerySysValue function obtains system information. The PMWIN.H header file defines 48 identifiers, all of which begin with the prefix SV, for use with this function. One of these constants is SV_MOUSEPRESENT, which a program uses to determine if a mouse is present on the machine.

To take another example, DBM_STRETCH is a constant that you use with the WinDrawBitmap function. This identifier indicates that the bitmap is to be drawn stretched (or compressed) to fill a particular rectangle. For the GpiSetColor and GpiSetBackColor functions, you use identifiers beginning with the prefix CLR, such as CLR_RED and CLR_DARKBLUE.

Some of the constants are used to iden-

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■ ENVIRONMENTS

tify messages. Window messages have WM prefixes, such as WM_PAINT, for example. Some of the standard windows defined in the Presentation Manager understand special messages. For example, buttons understand button messages, which begin with the prefix BM.

BIT FLAGS In a function such as GpiSetColor, you use only one identifier to indicate the color, such as CLR_RED or CLR_DARKBLUE. However, in other functions, you can use more than one constant in the function call.


Earlier, I mentioned that the DBM_STRETCH identifier is a constant you use with the WinDrawBitmap function. Here's the complete set of DBM identifiers with their values:

Identifier	Value
DBM_NORMAL	0x0000
DBM_INVERT	0x0001
DBM_HALFTONE	0x0002
DBM_STRETCH	0x0004
DBM_IMAGEATTRS	0x0008

Constants such as these are called *bit flags*, because each constant (with the exception of DBM_NORMAL) has one bit set in the value. You can use more than one option by combining these bit flags with the C bitwise OR operator. For example, if you want to draw an inverted bitmap that is stretched or compressed to fill a rectangle, the last parameter to WinDrawBitmap is

DBM_INVERT | DBM_STRETCH

If you want to draw the bitmap without any options, you can use DBM_NORMAL. But notice that DBM_NORMAL has a value of 0, which means that you can use 0 as the last parameter instead. Most of the bit flag constants in the Presentation Manager are defined in such a way that a 0 value indicates the default normal operation of the function.

CONTROVERSIAL? So far, I don't think we've encountered anything that will cause any fierce controversy. But we are not finished with these header files yet. In my next Environments column I'll probably touch a few hot buttons among programmers with these OS/2 header-file definitions of new data types. 

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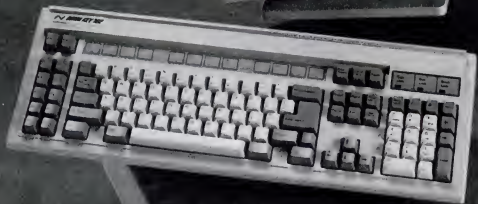
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OS/2 ENVIRONMENTS, TIMES, AND DATES



We continue to update our Power Programming Library with OS/2 equivalents of our DOS routines; this issue covers GETENV.ASM and converting times and dates into ASCII strings.

Two issues ago, I began updating the Power Programming Library for compatibility with Microsoft OS/2 by presenting OS/2 versions of the ARGV.ASM and ARGV.ASM routines. In this issue, I'll update the routines for accessing the environment and for converting times and dates into ASCII strings. In the next issue, I'll finish up these updates, and we'll move on to indexed file management under both OS/2 and DOS.

OS/2 ENVIRONMENT BLOCKS In OS/2, as in DOS, each program you load has its own "environment." The environment is composed of a series of ASCII (null-terminated) strings—called environment variables—in the form

NAME=VALUE

The entire set of these strings is terminated by an additional zero byte. In both systems, environment variables are used by the command process to search for executable files (PATH=), to format the user prompt (PROMPT=), and to locate the file from which it was loaded (COMSPEC=). Other environment variables, such as INCLUDE= and LIB=, are utilized by application programs and do not influence the behavior of the operation system proper.

A DOS application program is provided with a pointer to its environment at offset 002Ch in the program segment prefix (PSP). (Under DOS 3.0 or later, the fully qualified pathname of the file from which the program was loaded follows the two zero bytes that terminate the environ-

ment.) The environment is inherited from the program's parent and is static during its lifetime. A program can allow its own children to inherit an unchanged copy of its environment, or it can pass them a pointer to a modified or completely new environment block. A detailed discussion of DOS environments and a routine called GETENV.ASM to access environment variables were published in the January 12, 1988, installment of this column.

Environments blocks in OS/2 look very much like those of DOS, Version 3.x, with one exception. As shown in Figure 1, under OS/2, along with the pathname of the program's executable file, the command-line information is also appended to the environment block. An OS/2 application receives a segment selector for its environment in register AX when it begins executing. It can also obtain the segment

selector for the environment at any later time by calling DosGetEnv, the kernel's application program interface (API) function.

Once its selector is in hand, the environment can be searched in a straightforward fashion, using the same techniques I presented earlier. Figure 2 contains an OS/2 version of the GETENV.ASM routine that parallels the DOS version, except that the OS/2 version doesn't require that the calling program supply the address of the environment.

Interestingly, OS/2 also contains a system function, DosScanEnv, to search the environment. Figure 3 presents an alternative version of GETENV.ASM that uses this function instead of finding environment variables the hard way. This saves a few bytes of code but presumably gives up some speed in exchange. Of course, since

```

0000  3 5 8 2 4 7 5 8 3 0 6 3 3A 5C 6F 73 32 73 79 73 5C #123456789ABCDEF
0010  63 6F 6D 6D 61 6E 64 2E 63 6F 6D 88 43 4F 4D 53 command.com.COMS
0020  58 45 43 3D 43 3A 5C 4F 53 32 53 59 53 5C 43 4D PEC=C:\OS2SYS\CH
0030  44 2E 45 58 45 08 58 41 54 48 3D 43 3A 5C 3B 43 D.EXE.PATH=C:\C
0040  3A 5C 4F 53 32 53 59 53 3B 43 3A 5C 54 4F 4F 4C I:\OS2SYS\C\I\TOOL
0050  53 88 44 58 41 54 48 3D 43 3A 5C 3B 43 3A 5C 4F 4F 4C S.DPATH=C:\C\I\O
0060  53 53 53 53 53 3B 43 3A 5C 54 4F 4F 4C 53 88 49 S2SYS:C\I\TOOLS.I
0070  45 43 4C 55 44 45 3D 63 3A 5C 69 68 63 6C 75 64 INCLUDE=C:\includ
0080  65 88 4C 49 42 3D 63 3A 5C 69 62 88 49 48 49 e.LIB=C:\lib.INI
0090  54 3D 63 3A 5C 69 62 69 74 88 54 4D 58 3D 63 3A 5C 74 65 \temp.TEMP=C:\te
00A0  5C 74 65 6D 78 88 54 45 4D 58 3D 63 3A 5C 74 65 mp.PROMPT=Sp% PH
00B0  6D 78 88 58 52 4F 4D 58 54 3D 24 78 24 5F 58 4D Sg.C\PH\FIND.
00C0  24 67 88 43 3A 5C 58 4D 46 5C 46 49 4E 44 2E EXE.find. /n "ex
00D0  45 88 45 88 66 69 6E 64 88 2F 6E 28 22 65 78 trn" start.asm..
00E0  74 72 6E 22 28 73 74 61 72 74 2E 61 73 6D 88 88

```

Figure 1: This sample hex dump shows the information that is passed to an OS/2 program at entry. The command line C>find /n "extrn" start.asm <Enter> results in the OS/2 FIND.EXE utility being loaded with this environment block, the fully qualified filename at offset 00C4h, and the command-line information beginning at offset 00D4h.

■ POWER PROGRAMMING

programs do not search their environment very often, GETENV's speed performance is not terribly important.

Space considerations preclude presenting the OS/2 version of SHOWENV.ASM—the demo program for GETENV—in this column. You can download it, however, together with the source code for both versions of GETENV.ASM, from PC MagNet.

OS/2 TIMES AND DATES In previous Power Programming columns, I also presented two DOS subroutine packages, TD.C (PC Magazine, May 17, 1988) and

TD.ASM (PC Magazine, May 31, 1988), for formatting times and dates. As you'll recall, DOS application programs must be able to deal with two different representations of the time and date used by that operating system, which I called the "four-byte" and the "two-byte" formats. The two-byte format is used in disk directories and is returned by various file-oriented functions—particularly the directory searching functions. The four-byte format is used by the DOS functions that specifically set or get the current system time and date.

OS/2 uses exactly the same time and

date format for file-oriented functions as does DOS, but the new operating system presents the current time and date in quite a different manner. Application programs can obtain the latter information in two different ways: by inspecting the global information segment, which is a read-only segment containing various useful information common to all programs; or alternatively by calling the kernel API function DosGetDateTime.

The first technique, using the global information segment, is usually preferable because it is extremely fast. Programs obtain the segment's address during their ini-

```

;-----
; GETENV --- Return address and length of variable portion of environment
; string OS/2 version using DosGetEnv
;
; Copyright (c) 1989 Biff Communications Co.
; PC Magazine + Ray Duncan
;
; Call with: DS:SI = ASCII env. variable name
; Returns: ES:DI = address of env. variable
;          AI = length (0 = not found)
; Uses: nothing
;-----

; .286
; enviro DosGetEnvVar: far ; OS/2 API function
;
; _TEXT segment word public 'CODE'
; assume cs:_TEXT
;
; enviro equ (bp-2) ; local variables...
; envioff equ (bp-4) ; environment segment
;
; public getenv ; make visible to linker
;
; getenv proc near
;
; enter 4,0 ; allocate local variables
; push cs ; save registers
; push si
;
; push ax ; get selector for environment
; lea ax,enviro ; and offset of command line
; push ax
; lea ax,envioff ;
; push ax
; call DosGetEnv ; transfer to OS/2
; mov ax,ax ; did function succeed?
; je get1 ; jump if successful
;
; mov ax,ax ; DosGetEnv failed,
; jmp get3 ; return AX = 0
;
; get1: mov es,enviro ; set ES:DI = command line
; mov cx,SI ; assume max env. = 32 KB
; mov di,di ; initial env. offset
; mov ax,ax ; default length result
;
; get2: cmp byte ptr es:[di],0 ; check for end of environment
; jnz get3 ; and clobber, return AX = 0
;
; pop si ; initial line address of target
; push si
;
; repz cmpsb ; compare target and env. strings
; jae get3 ; jump if incomplete match
; jbe get4 ; jump if match was complete
;
; get3: repz scasb ; match incomplete, scan for end of env str
; jmp get2 ; and try again to match
;
; get4: push di ; save address after = sign
; repz scasb ; look for end of this string
; pop ax ; get back starting address
; mov di,ax ; find string length
; dec ax ; don't include null byte
;
; get5: pop si ; common wait point restores registers
; pop ax ; discard local variables
; ret ; return to caller
;
; getenv endp
;
; _TEXT ends
; end

```

Figure 2: GETENV.ASM is a subroutine for OS/2 applications that searches for an environment variable using DosGetEnv.

```

;-----
; GETENV --- Return address and length of variable portion of environment
; string OS/2 version using DosScanEnv
;
; Copyright (c) 1989 Biff Communications Co.
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;
; Call with: DS:SI = ASCII env. variable name
; Returns: ES:DI = address of env. variable
;          AI = length (0 = not found)
; Uses: nothing
;-----

; .286
; enviro DosScanEnvVar: far ; OS/2 API function
;
; _TEXT segment word public 'CODE'
; assume cs:_TEXT
;
; valptr equ (bp-4) ; local variables...
; public getenv ; make visible to linker
;
; getenv proc near
;
; enter 4,0 ; allocate local variable
; push cs ; save register
; push di ; address of name string
; push si ; address to receive
;
; lea ax,valptr ; pointer to value string
; push ax
; call DosScanEnv ; transfer to OS/2
; mov ax,ax ; env. variable found?
; je get1 ; jump if it exists
;
; mov ax,ax ; else return length=0
; jmp get2
;
; get1: lea di,dword ptr valptr ; load value string addr.
; mov cx,-1 ; find length of string
; mov al,al ; by scanning for null
; repz scasb
; mov cx,ax ; and let AX = length,
; mov ax,cx ; ES:DI = address
; mov di,dword ptr valptr ; common exit point
; pop cx ; restore registers
; pop ax ; discard local variables
; ret ; return to caller
;
; getenv endp
;
; _TEXT ends
; end

```

Figure 3: This is an alternative version of GETENV that uses the OS/2 function DosScanEnv to search for an environment variable.

■ POWER PROGRAMMING

tialization by calling `DosGetInfoSeg`. At any point during their execution, they can then get at any of the information the segment contains without the overhead of additional operating system function calls. The information that is related to the current date and time is located within the OS/2 global information segment at the offsets shown in Figure 4.

If you use the global information segment, however, you must take care to al-

low for a rollover that might occur between the time your program reads one field and the next. Suppose, for example, that at 23:59:59 your program fetches the hours field, but that it is then interrupted long enough for the seconds field to roll over. When your program resumes executing and fetches the minutes and seconds field, the time is 00:00:00, but your program will conclude that the current time is 23:00:00. The most simple way for you to guard



OS/2 Global Time and Date Information

Offset (Bytes)	Length (Bytes)	Contents
0	4	Elapsed time from 1-1-1970 in seconds
4	4	Milliseconds since system boot
8	1	Hours (0-23)
9	1	Minutes (0-59)
0Ah	1	Seconds (0-59)
0Bh	1	Hundredths of seconds (0-99)
0Ch	2	Time zone (minutes +/- GMT, -1=undefined)
0Eh	2	Timer interval (units = 0.0001 seconds)
10h	1	Day (1-31)
11h	1	Month (1-12)
12h	2	Year (1980+)
14h	1	Day of week (0=Sunday, 1=Monday, etc.)

Figure 4: Application programs can obtain the time and date information by checking the OS/2 global information segment.



OS/2 DosGetTime Date and Time Structure

Offset (bytes)	Length (bytes)	Contents
0	1	Hours (0-23)
1	1	Minutes (0-59)
2	1	Seconds (0-59)
3	1	Hundredths of seconds (0-99)
4	1	Day (1-31)
5	1	Month (1-12)
6	2	Year (1980+)
8	2	Time zone (minutes +/- GMT -1=undefined)
10	1	Day of week (0=Sunday, 1=Monday, etc.)

Figure 5: The structure of the time and date information returned by the OS/2 function `DosGetDateTime`.

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against this bug is to read all the fields of interest repeatedly until you get two sets of values that are the same.

The second method of getting the current date and time under OS/2—namely, calling the API `DosGetDateTime` function—is ordinarily used only by those programs that need to obtain these values infrequently or that need to alter the date and/or time.

As shown in Figure 5, `DosGetDateTime` is called with the address of an 11-byte structure that OS/2 fills with the current date, time, time zone, and day of the week. The complementary `DosSetDateTime` function uses the same structure. Therefore, when a program needs to modify some part of the time or date, it first calls `DosGetDateTime` to fill the structure with valid information, makes any necessary changes, and then writes the updated information back to the operating system with the `DosSetDateTime` function.

DosGetDateTime is also handy in isolated routines where the address of the global information segment is not already known and the cost of a call to DosGetInfoSeg is no worse than that of a call to DosGetDateTime.

The source listing TD.C contains the OS/2 version of the C language Power Programming routines to format binary times and dates into ASCII strings. Similarly, TD.ASM contains the OS/2 assembly language routines. These listings, together with OS/2 versions of the time and demo programs (TRYTD.C and TRYTD.ASM), are all available for downloading from PC MagNet. The parameters and results of these functions are exactly the same as for the DOS versions. They are summarized in the tables "Time and Date Routines," presented in *Power Programming, PC Magazine*, May 17, 1988, and May 31, 1988. The format of the time or date string is sensitive to the "current country," which is controlled by a COUNTRY = directive in the CONFIG.SYS file.

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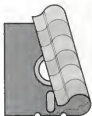


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SPREADSHEET CLINIC



Loading and saving hidden macro sheets in Microsoft Excel; retrieving segments of a 1-2-3 worksheet; creating a series of dates for the last day of each month in 1-2-3.

Here's a macro to recover portions of a 1-2-3 worksheet

I, like many Lotus 1-2-3 users, wish that it had an undo feature. Whenever I have accidentally erased or overwritten a large portion of a worksheet, I have to retrieve the latest version of my worksheet and re-enter all the changes. Recently, I discovered a better way to recover from these types of errors. Instead of retrieving the previous version of the worksheet in its entirety, I use the /File Combine Copy Named/Specified-Range command. This retrieves only the portion of the worksheet I need and brings it directly into the current version.

To automate this process, I developed the macro in Figure 1. The first statement presents the prompt "Press [Enter], then highlight the range to replace . . ." When you press Enter, 1-2-3 executes the statement in cell B2. This, in turn, issues the /Range Name Create command, specifies the name RANGE, and then pauses. During this pause, highlight the range you want to replace. For example, if you want 1-2-3 to replace the entries in cells A1..B5 with the entries in cells A1..B5 from the worksheet you most recently saved, you would highlight cells A1..B5. Then press Enter and 1-2-3 will assign the name RANGE to the range you highlighted.

The third statement enters the absolute address of the upper-left cell of the range you specified into the cell named UPPERLEFT (B11). For example, if you highlighted cells A1..B5, this statement would

enter the label 'SA\$1 into cell B11.

Statements four through six enter the address of the lower-right cell of the range you specified into the cell named LOWERRIGHT (B13). The /Range Name Create command is reissued and the name RANGE is specified. At this point, the range that you highlighted earlier will be highlighted again, and the cursor will be in the lower-right corner of the range. Then the absolute address of the cell in the lower-right corner of the range is entered into the cell named LOWERRIGHT. For example, if you had highlighted cells A1..B5, 1-2-3 would enter the label 'SB\$5 into that cell.

The seventh statement moves the cell pointer to the upper-left cell of the range that you want to replace. Then, the final statement replaces the entries in that range with the entries from the file you will now specify (hopefully, the most recently saved version of the same worksheet). This last statement begins by issuing the /File Combine Copy Named/Specified-

Range command. Then, it types the label stored in UPPERLEFT (the absolute address of the upper-left cell of the range that you want to replace), two periods, and then the label stored in LOWERRIGHT (the absolute address of the cell in the lower-right corner of this range).

After 1-2-3 locks in these coordinates, it presents a list of filenames and pauses while you select the previous version of the worksheet on the screen at this time. Press Enter and 1-2-3 will replace the entries in the cells you specified with the entries in the corresponding cells of the file you selected, and then end the execution of the macro.—Richard L. Aitkins; Renton, Washington

We applaud Mr. Aitkins's clever use of the /File Combine command. Since the /File Combine command does not read range names, the range names in the current version of the worksheet will not be affected. In order for this technique to be useful, of course, you must save your

```

1  \n      A          C          D          E          F          G          H
2  {GetLabel "Press [Enter], then highlight the range to replace...";NULL}
3  /rncrange "r1"
4  {Let UPPERLEFT,0CELL("address",RANGE)}
5  /rncrange
6  {Let LOWERRIGHT,0CELLPOINTER("address")}
7
8  {Goto|RANGE
9  /fcon(UPPERLEFT)..(LOWERRIGHT)"(v)"
10
11 NULL
12 UPPERLEFT
13 LOWERRIGHT
14

```

Figure 1: This macro will automate bringing the range of data from the file you select into your current 1-2-3 worksheet at the position you specify.

■ SPREADSHEET CLINIC

work on a regular basis. Otherwise, you won't have a recent version of the file from which to combine information.

Creating a date series of the last day of each month

In the July 1988 issue of Spreadsheet Clinic, Jack McKinley presented a macro to create a series of dates exactly 1 month apart. In my work with 1-2-3, I often need to create series of dates for the last day of each month. The macro in Figure 2 does just this.

The principle behind this macro is that the serial date value of the final day of any month is one less than the serial date value of the first day of the next month—a value that is easy to find.

The first two statements in this macro solicit the month and year whose last day you want to use as the starting date in the series. 1-2-3 places these values into the cells named MONTH (B13) and YEAR (B14), respectively.

The third statement in this macro issues the /Range Name Create command, specifies the range name FILLRANGE, and then pauses. While the macro pauses, highlight the single-column, multiple-row range that you want to fill with the date series. The number of rows in the range determines how many dates will be in the series. For example, if you highlighted cells A21..A30, 1-2-3 would create a series of ten date values. Press Enter and 1-2-3 assigns the range name FILLRANGE to the cells you highlighted.

The next two statements enter a formula that returns the final day of the month you specified into the first cell of the range you specified. After moving the cell pointer to that cell, 1-2-3 will enter the formula

```
@IF (MONTH=12,
    @DATE (YEAR+1,1,1)-1,
    @DATE (YEAR,MONTH+1,1)-1)
```

into that cell. If the value in MONTH is 12, indicating a starting month of December, 1-2-3 will calculate the serial date value of the first day of the following year and then subtract 1 from it. If the value in MONTH is not 12, 1-2-3 will subtract 1 from the serial date value of the first day of the following month.

```
1  \d A (GetNumber "Starting month (1-12)? ",MONTH)
2      (GetNumber "Starting year (1988-99)? ",YEAR)
3      /rnf FILLRANGE ("2")
4      (Goto) FILLRANGE
5      @IF (MONTH=12,@DATE (YEAR+1,1,1)-1,@DATE (YEAR,MONTH+1,1)-1)
6      (Down)
7      @IF (@MONTH ({Up}))=11,@DATE (@YEAR ({Up}))+1,1,1)-1,
8      @IF (@MONTH ({Up}))=12,@DATE (@YEAR ({Up}))+1,2,1)-1,
9      @DATE (@YEAR ({Up}),@MONTH ({Up}))+2,1,1)-1)
10     /o (Down). (Down FROM (FILLRANGE)-3)
11     (Up)
12     /rfd1 (End) (Down)
13     /rv (End) (Down)
14     MONTH
15     YEAR
```

Figure 2: This macro lets you find the final days of each month by filling any column you specify with the serial date values of the last days of successive months.

```
1  \d A (GetNumber "Starting month (1-12)? ",MONTH)
2      (GetNumber "Starting year (1988-99)? ",YEAR)
3      /rnf FILLRANGE ("2")
4      (Goto) FILLRANGE
5      @IF (MONTH=12,@DATE (YEAR+1,1,1)-1,@DATE (YEAR,MONTH+1,1)-1)
6      (If @COLS (FILLRANGE)>1) (Branch COLUMNS)
7      (Down)
8      @IF (@MONTH ({Up}))=11,@DATE (@YEAR ({Up}))+1,1,1)-1,
9      @IF (@MONTH ({Up}))=12,@DATE (@YEAR ({Up}))+1,2,1)-1,
10     @DATE (@YEAR ({Up}),@MONTH ({Up}))+2,1,1)-1)
11     /o (Down). (Down FROM (FILLRANGE)-3)
12     (Up)
13     /rfd1 (End) (Down)
14     /rv (End) (Down)
15     COLUMNS
16     (Right)
17     @IF (@MONTH ({Left}))=11,@DATE (@YEAR ({Left}))+1,1,1)-1,
18     @IF (@MONTH ({Left}))=12,@DATE (@YEAR ({Left}))+1,2,1)-1,
19     @DATE (@YEAR ({Left}),@MONTH ({Left}))+2,1,1)-1)
20     /o (Right). (Right @COLS (FILLRANGE)-3)
21     (Left)
22     /rfd1 (End) (Right)
23     /rv (End) (Right)
24     MONTH
25     YEAR
```

Figure 3: The macro shown above will let you fill either a column or a row with the serial date values of the final days of successive months.

Statements six and seven move the cell pointer down to the next cell (the one below the cell into which the formula above was entered) and enters

```
@IF (@MONTH (cell))=11,
    @DATE (@YEAR (cell))+1,1,1)-1,
    @IF (@MONTH (cell))=12,
    @DATE (@YEAR (cell))+1,2,1)-1,
    @DATE (@YEAR (cell),@MONTH (cell))+2,1,1)-1)
```

In this formula, "cell" is the address of the cell that contains the first formula. This second formula calculates the serial date value of the final day of the next month by subtracting 1 from the serial date value of the first day of the month 2 months ahead of the previous month.

After 1-2-3 enters this formula into the second cell of the FILLRANGE, it executes the statement in cell B8, which copies that formula into the remaining cells of FILLRANGE. Since the references in this formula are relative, each copy will reference the result of the formula immediately above it and return the serial date value of the final day of the next month.

After 1-2-3 enters the date-producing formulas into the cells of the FILLRANGE, it executes the final three statements in the macro. These assign the Date 1 format to the cell of the range and then re-

place the formulas in that range with their current values.—*Alan Wasser; New York, New York*

This macro is a perfect complement to the one presented by Mr. McKinley. To fill a row instead of a column, you would simply replace each occurrence of the keyword {Down} in Mr. Wasser's macro with the keyword {Right}, replace each occurrence of the keyword {Up} with the keyword {Left}, and replace the @ROWS function in cell B8 with the function @COLS. If you wanted to fill either columns or rows, you could use the macro shown in Figure 3.

Saving and loading hidden macro sheets in Excel

Most users of *Microsoft Excel* know that macros are contained in special sheets called macro sheets. Macro sheets, like worksheets, can be hidden. Since I prefer to have as few documents as possible cluttering my workspace, I almost always hide my macro sheets.

I used to do this by selecting the Hide command from the Window menu each time I opened a macro sheet. I simply pulled down the Window menu while the macro sheet I wanted to hide was active and selected the Hide command. (This command is visible only when *Excel* is in the Full menu mode.) As soon as I did this, the macro sheet disappeared from view. However, it remained in RAM so I could still run any macros that were contained in that sheet.

Now I have a way to save a macro sheet in hidden form. Further, the macro sheet will remain hidden when I subsequently open it.

When you hide a window, the menu bar for that window disappears. You cannot save a hidden window simply by pulling down the File menu and selecting the Save or Save As commands. But you can get *Excel* to save it for you.

First, make a change to the macro sheet. This can be as simple as making an entry and then deleting it. This step is to alert *Excel* that the macro sheet has been changed since you last saved it.

After making a change to the macro

sheet, hide it by pulling down the Window menu and choosing the Hide command. The macro sheet will disappear from the screen.

Next pull down the File menu and select the Exit command. Since you've made a change to your macro sheet since the last time you saved it, *Excel* will beep and display a dialog box that contains the message "Save changes in filename," where filename is the name of the macro sheet. To save the macro sheet, select Yes. *Excel* will save it and return you to Windows. Since the macro sheet was hidden when *Excel* saved it, it will be saved in hidden form.

Now the next time you open this macro sheet it will be hidden. In fact, it will remain hidden until you unhide it and save it again. (To unhide a hidden window, choose the Unhide command from the Window menu of an unhidden window, or if no windows are visible, choose the Unhide Window command from the File menu.) Since the macro sheet is open, however, you can run the macros that are contained within it.

I mainly use this technique for keeping my library of utility macros active but invisible. After hiding the macro sheet that contains these macros, I load *Excel* by selecting the name of that sheet. When I do this, *Excel* loads itself, then automatically loads the hidden macro sheet. I have access to my utility macros, and yet they don't clutter up my workspace.—*Miguel Morell; Madrid, Spain*

This clever technique can be used to save hidden worksheets as well as hidden macro sheets. To get *Excel* to save the document in hidden form, you must make a change to the document and then hide it before exiting from *Excel*.

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USER-TO-USER



Understanding assembler programming through disassembling .COM files with DEBUG and EDLIN; tips on using DOS 3.3's CALL command to alter the PC's environment.

Altering the environment using DOS 3.3's CALL command

For years the environment has been somewhat of a useless facet of DOS. The main reason for this is that a "child" process is unable to alter the environment of the "parent." Programs to alter the environment have been impossible because the only environment they can alter is their own temporary copy. Many programs exist to allow branching in batch procedures via the error level. Though this does work, it introduces cryptic expressions in the batch procedure and makes debugging and later editing difficult.

DOS 3.3 gives you the facility to change all this via the CALL command. The following batch procedures allow the user to enter a string and then assign it to the DOS environment. This string can be used for subsequent branching decisions. Most of all, it renders the batch procedure much more readable in its flow pattern. Decisions are based on words that immediately mean something, rather than numbers that require at least one level of dissection to decipher. For example, the procedure REPLDEMO in Figure 1 will prompt the user to enter yes or no at the prompt, and then proceed based on that decision.

Initially, this procedure will seem somewhat cumbersome, but once the batch files have been created, the only statement that is needed in other batch files is CALL GETREPLY.—R. Alan Johnson; Pendleton, South Carolina

This tip originally required a C program to take user input. I kept the concept but managed to do without the C program and use only standard DOS and batch file commands. GETREPLY.BAT in Figure 2 combines an existing text file with user input to create a command that sets the environment variable REPLY to whatever the user types. Before you can use it, you must create a small text file named SETREPLY that contains this one line:

```
SET REPLY=
```

Make sure that you do not add a carriage

return after the equals sign.

GETREPLY copies the contents of SETREPLY plus whatever the user types at the keyboard into SETREPLY.BAT. It calls SETREPLY.BAT to set the environment variable and then deletes it.

REPLDEMO.BAT (Figure 1) shows this technique in action. The FOR command after the GETREPLY line checks the reply against a set of options. In batch files, the == comparison is case sensitive, but batch labels are not. Thus whether you answered "YES" or "yes", the FOR command will jump to the label :yes. Note

```
@ECHO OFF
ECHO Do you want to continue? Answer yes or no.
CALL GETREPLY
FOR %%f IN (yes no YES NO) DO IF %reply%==%%f GOTO %%f
ECHO You entered "%reply%" -- that is not yes or no.
GOTO end
:yes
ECHO You entered yes.
GOTO end
:no
ECHO You entered no.
:end
```

Figure 1: The REPLDEMO.BAT file takes input using the GETREPLY.BAT file and branches according to the response that the user enters.

```
@ECHO OFF
REM Requires DOS 3.3 or higher.
ECHO Enter your response, then press Ctrl-Z and Enter
COPY SETREPLY+CON SETREPLY.BAT > NUL
CALL SETREPLY
DEL SETREPLY.BAT > NUL
```

Figure 2: When you CALL GETREPLY.BAT, the environment variable REPLY is set to whatever the user enters. Before you use this file, remember to create the SETREPLY file.

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that it won't recognize "Yes" or "yEs"—if you want it to do so you'll have to expand the FOR statement.

You can't use this technique in DOS versions before 3.3 because without CALL you have to invoke a secondary command processor to call another batch file. For example,

COMMAND /C GETREPLY

All of the environment changes that you make in this secondary command processor disappear when control returns to the primary one.

Disassemble .COM files using only DEBUG and EDLIN

This column often features DEBUG scripts that create programs. These scripts take advantage of DEBUG's mini-assembler functions. However, DEBUG can also *disassemble* code. One way to learn about assembler programming is to examine the disassembled listings of working programs.

Step One: If you load a program into DEBUG, you can unassemble it in 32-byte chunks with the U command. However, this doesn't give you the full view necessary to see how the program works. You need a complete listing of the program so you can follow JUMP and CALL instructions to their destinations. The command

```
U 100 L #####
```

where ##### represents the size of the program, will disassemble the whole thing. So your first step, then, is to find out the size of the program. The script file DISASM.SCR below

```
RCX
```

```
Q
```

gives DEBUG the commands needed to write out the size and then quit. Create DISASM.SCR using your favorite text editor—don't forget the blank line after RCX and after Q. Now try this command with a small .COM file:

```
DEBUG filename.com < disasm.scr > disasm.tmp
```

The resulting file, called DISASM.TMP,

will look something like this:

```
-RCX
CX 0018
+
-Q
```

This file contains all of the output that DEBUG produced when using DISASM.SCR as input, including the all-important file size. The example file for the EDLIN script was 0018h bytes.

Step Two: We'll use EDLIN to modify DISASM.TMP into a script file that tells DEBUG to disassemble the program. To do that, we need an EDLIN script. We'll need to use EDLIN to create it, too, because the file has to contain a Ctrl-Z (Z) character. In a text file, "Z" usually indicates the end of the file and many editors won't even allow you to use this character. EDLIN will, though you can't load the file back into EDLIN for later editing because it will stop loading at the "Z".

The file DISASM.EDL in Figure 3 is the EDLIN script we want to produce. Here's how to do it:

■ At the DOS prompt, enter EDLIN DISASM.EDL. You will get the message "New File."

■ Enter 11 to start inserting text at line 1.

■ You will see "1*". Type in the first line from Figure 3 and hit Enter.

■ You will see "2*". Type in the second line, pressing Ctrl and hitting Z to enter "Z". After you finish typing this line press Enter.

■ Do the same for the remaining three lines.

■ Press "Z" at the start of the next line and Enter.

■ You'll be back to a * prompt. Press E to Exit, then press Enter.

What does this file do? The first line eliminates the dash in line 4 of the input. The next line replaces RCX in line 2 with U 100 L. Lines 3 and 4 delete lines 3 and 1 of the source, respectively. And the last

```
4R-
2RCX*Z 100 L
3D
1D
E
```

Figure 3: This EDLIN script creates a DEBUG script to disassemble the whole file.

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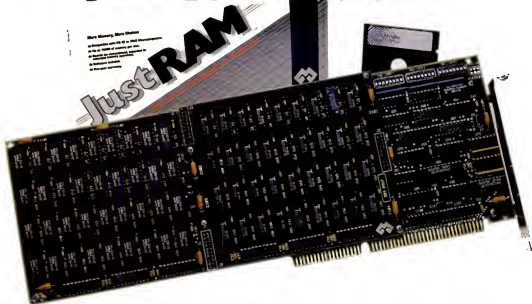
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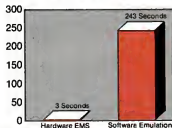
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line saves the changed file and exits.

To operate this script, give the following command:

```
EDLIN DISASM.TMP < DISASM.EDL
```

EDLIN will change DISASM.TMP. Now it will look like this:

```
U 100 L 0018
Q
```

Step Three: Now use the modified script to tell DEBUG to disassemble the whole program. For easy perusal, direct the output to a file with the command

```
DEBUG FILENAME.COM < DISASM.TMP > FILENAME.LST
```

Now you wait—DEBUG isn't a fast disas-

sembler. The .LST file will be 15 to 20 times as large as the input .COM file.

DISASM.BAT (Figure 4) combines the techniques detailed above. It assumes that DEBUG and EDLIN are available on your path and that DISASM.SCR and DISASM.EDL already exist. Pass it a filename without an extension, and it creates a .LST file for that filename. For example,

DISASM FORMAT

would produce FORMAT.LST.

The file produced by the method above will be much larger than the program file. The .LST file for FORMAT.COM will barely fit on a floppy disk. So be sure you

use this technique on small utilities only!

The U command attempts to Unassemble everything, even data. For example, a long stretch of 0 bytes will unassemble to a series of spurious ADD [BX+SI], AL operations. Worse, the first few proper instructions after a data area may be "out of sync" and generate the wrong commands. DEBUG is not a perfect disassembler, but you don't have to pay for it.

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```
DEBUG %1.COM < DISASM.SCR > DISASM.TMP
EDLIN DISASM.TMP < DISASM.EDL
DEBUG %1.COM < DISASM.TMP | FIND ":" > %1.LST
DEL DISASM.TMP
```

Figure 4: DISASM.BAT creates a .LST file for a .COM file without its extension.

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The cryptic Appendix in the *WordPerfect*, Version 5.0, manual hints that macros have been given considerably more power. Version 5.0 macros have, in fact, acquired many of the features of a true programming language: subroutines, conditional branching, GOTO statements, and even exception handlers.

The new features of *WordPerfect* 5.0 can at first seem overwhelming, so I've provided a simple macro to get you started. You should refer to the "Advanced Macros" appendix for a detailed description of the macro commands used below.

This sample macro finds all underlined text and converts it to bold (UTOB). It will use the new macro commands to create a loop that repeats to find all underline codes. In *WordPerfect* 4.2 you'd have needed a self-calling macro, but in Version 5.0 you just use {LABEL} and {GO}.

First, let's enter as much of the macro as possible in standard keystroke-recording mode, as shown in Figure 1(a). Note that when you start to define a macro, you get a chance to enter whatever description you like.

To enter the advanced macro commands, you must be in the macro editor. Hit Ctrl-F10 and supply the name UTOB again. Choose option 2, Edit, and in the macro-editing screen choose option 2, Edit Action. The macro you now enter should look like Figure 1(b). At this point you can insert text into the macro, add *WordPer-*

fect command keys, or insert advanced macro commands.

The macro recorded up to this point will find the first underline and bold it. We need a loop so that it will find *all* the underlines. Position your cursor just after

{Home}{Home}{Home}{Up}

and press Ctrl-PgUp. (In the macro editor, the Ctrl-PgUp key always brings up the

menu of advanced commands.) Press L to jump to commands beginning with L and highlight LABEL. Then hit Enter to insert a {LABEL} command in your macro. The label needs a name, so type in loop. *Don't* omit the tilde (~) at the end.

Now move to the very end of the macro. Bring up the macro menu with Ctrl-PgUp, highlight GO, and press Enter. You'll get a {GO} command in your mac-

(a)

```
<Ctrl-F10>
UTOB<CR>
<Home><Home><Home><Up>
<F2><F8><F2>
<Alt-F4>
<F2><F8><F8><Left><BKS><F2>
<F6>
<Left><BKS>Y
<Ctrl-F10>
```

```
Begin macro def
Call it UTOB
To top of document before any codes
Search for begin Underline {{UND}}
Block on
Search for end Underline {{undj}}
Bold the block
Delete the underline
End macro def
```

(b)

```
{DISPLAY OFF}{Home}{Home}{Home}{Up}{Search}{Underline}{Search}
{Block}{Search}{Underline}{Underline}{Left}{Backspace}{Search}{Bold}
{Left}{Backspace}Y
```

(c)

```
{DISPLAY OFF}
{ON NOT FOUND}{RETURN}~
{Home}{Home}{Home}{Up}
{LABEL}loop~
{Search}{Underline}{Search}
{Block}{Search}{Underline}{Underline}{Left}{Backspace}{Search}
{Bold}
{Left}{Backspace}Y
{GO}loop~
```

Figure 1: A WordPerfect 5.0 macro that replaces all underlining codes with boldface. (a) This portion of the macro is identical to what you would type in using WordPerfect 4.2. (b) This is what you will see when you first enter the macro editor. (c) After adding the advanced macro commands, format your macro so it looks like this.

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ro. Type in loop-. When the macro reaches this point, it will go back to the label loop.

There's just one remaining problem. How does the loop ever end? Go back to the very start of the macro, just after the {DISPLAY OFF} code. Use Ctrl-PgUp once again, this time to get an {ON NOT FOUND} command from the macro menu. When it no longer finds any underlines, the macro has finished, so it can just return. Select {RETURN} from the macro command menu, and follow it with a tilde.

At this point your macro is admittedly rather difficult to read. You can reformat it, however, without changing its effect. Try putting it into the form shown in Figure 1(c). Just put your cursor at the position that's going to start a new line and hit Enter. Congratulations! You've created a macro with WordPerfect 5.0's advanced features. Hit F7 twice to exit the macro editor and try out your macro.

For additional practice you may want to create the inverse macro BOTU (bold to underline). Just copy UTOB.WPM to BOTU.WPM and bring up BOTU in the macro editor. Replace occurrences of {Underline} with {Bold} and vice versa, using the Del key to delete the old code and F6 or F8 to insert the new. —Neil J. Rubenking

Productivity Tip

Microsoft Word lets you transpose words with the mouse, but it's usually faster to type than to reach for the mouse. Here's a useful macro that will do the job from the keyboard:

```
<f8><del><f7><ins>
```

Type this in and copy it to Transpose <Ctrl T>W. To use it, place the cursor anywhere on the second word to transpose, and hit <Ctrl T>W.

Speed up line drawing in Microsoft Word 4.0, and change drawing characters on the fly

Figure 2 shows three macros that simplify the task of drawing lines in Microsoft Word 4.0. The first macro, DRAW, sets the screen display options for line drawing by turning off the paragraph marker, tabs, and other visible format characters that may interfere with screen readability for drawing. It then prompts you to choose the line-draw or shading character to use, and puts you into Line Draw mode.

To change drawing characters, you must first leave Line Draw mode by hitting Esc twice or typing Ctrl-F5. You can then reinvoke DRAW to pick the new character. DRAW is fast in the text mode, but it takes up to 3 seconds in graphics mode. If you can do the job satisfactorily in text mode, stay there.

UNDRAW is similar to DRAW, except that it uses the space character for drawing. This lets you use the cursor keys to erase errors—in text or line drawing—by drawing over them with a space character.

Finally, RESTORE resets the screen options to Complete, so that Word will once again show the paragraph markers, tabs, and so on. —Rick Lindquist; Dublin, Virginia

Anyone who does much line drawing will greatly appreciate this macro trio—particularly DRAW. Note that if you normally use Word with visible options set to "none," you won't need the RESTORE macro. Similarly, if you normally use visible options set to "partial," you'll need to adjust the macro accordingly.

On my tests, using an 8-MHz AT with an EGA, DRAW responded substantially faster than Mr. Lindquist indicates. How-

```
DRAW
<esc><on<left><up><f1>=Pause HIGHLIGHT LINE DRAW OR HATCHING CHAR AND HIT
RETURN<enter><ctrl f5>

UNDRAW
<esc><on<left><up><space><enter><ctrl f5>

RESTORE
<esc><ocenter>
```

Figure 2: A trio of macros that speed up line drawing in Word 4.0.

■ POWER USER

ever, if speed is a problem, simply change the DRAW macro to

```
<esc>on<down 2>t<down 2><right 2><f1>
<Pause HIGHLIGHT LINE DRAW OR
HATCHING CHAR AND HIT RETURN>
<enter><ctrl f5>
```

This will set *Word* for text mode as part of the macro. You will then probably want to reset it for graphics in the RESTORE macro.—*M. David Stone*

Using merge print to control automatic continuous footnote numbering in Word

The suggestion of D. A. Johns and M. David Stone's response (May 17, 1988) about controlling automatic footnote numbering in *Microsoft Word* both ignore a much simpler solution. If you create a main document that consists of nothing but Include statements and you limit any division-based formatting to the main document, footnotes will automatically number continuously without any special effort. The main document should take the form

```
<include c:\path\file1.doc>
<include c:\path\file2.doc>
```

The chevrons (guillemets) are produced by typing Ctrl-[for the left side and Ctrl-] for the right side.

Once you have created the main document with an Include statement for each individual file, choose the Print Merge Printer command, and *Word* will merge the individual files to the printer. (Alternatively, you could choose the Print Merge Document command, and *Word* will merge the files to a file.) In either case, *Word* will automatically number your footnotes sequentially.—*Eric J. Bidstrup; Bellevue, Washington*

Using the Include statement to merge multiple files is certainly the preferred approach where applicable. Unfortunately, it won't always work. It's limited to the simplest case, where the entire document can be defined in *Word* as a single division (though it may be broken into any number of files). D. A. Johns's solution was aimed at the less usual but still common case where you are forced to define multiple divisions—as, for example, to change the

number of columns per page. As Johns correctly stated, whenever *Word* begins a new division, it starts counting at 1 again, and if you want continuously numbered footnotes, you need some way around this reset.

There are also times when you may not want to use a master file of Include commands for other reasons. For example, if you want to print the revised page 350 of a 400-page manuscript, you may not want to wait while *Word* formats the first 349 pages (1 minute 59 seconds on an 8-MHz AT). Or you may have trouble matching the sequentially numbered footnotes in your printed manuscript to the footnotes that start with 1 within each file.

Finally, for those who use style sheets, be aware that if you use the Include statement in a master file, the style sheet attached to the master file will override any style sheets attached to individual files. To avoid unpleasant surprises when printing a multifile document, be certain that you have used the same style sheet for all of the files.—*M. David Stone*

Productivity Tip

When creating a *dBASE III* index to store on a floppy, it's faster to create the index on your hard drive and use DOS to copy it than to create the index directly on the floppy in one step. This is true in *Clipper* and *FoxBASE*, too.

The reason is that *dBASE* reads and writes in 512-byte sectors, while DOS's COPY reads and writes the complete file all at once. The same applies to *dBASE*'s COPY FILE. It's a snail compared with DOS's COPY.

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■ EDITED BY ROBERT L. HUMMEL

LANGUAGES

Input long data items simply in BASIC; locate the amount of space used by files in C; use QuickBASIC to define data types and declarations; update the date and time of files in C.



Using Microsoft's QuickBASIC to explicitly define data types and declarations

One of the nice features of QuickBASIC 4.0 is the ability to explicitly specify variable types. The syntax is

declare variablename AS type

where in place of declare you can substitute either DIM, COMMON, REDIM, SHARED, or STATIC; and where type can be either INTEGER, LONG, SINGLE, DOUBLE, STRING, or a user-defined type.

Unfortunately, this syntax does not work as you might expect—or at least not as I expected. For example, DIM X, Y AS STRING does not declare X and Y to be string variables—it only establishes Y as such. Similarly, COMMON SHARED I, J AS INTEGER declares only J to be an integer.

In order to declare more than one variable at a time in QuickBASIC 4.0, you must state the type explicitly for each variable such as DIM X AS STRING, Y AS STRING.—Gordon S. Buck; Baton Rouge, Louisiana

Microsoft has done an admirable job in producing the QuickBASIC 4.0 documentation, but there are a number of areas that could be clearer. One notable omission is an explanation of how fixed-length strings are declared when passed to functions and subprograms.

Using the new syntax, one might as-

sume a subprogram could be written to expect a fixed-length string to be as follows:

```
SUB SubName (X AS STRING * 10)
```

However (as you might expect), this doesn't work, and no guidance is given in the manuals beyond saying that you can't do it. In this case, it is important to understand that whenever a fixed-length string is passed to a subprogram or procedure (including those written in other languages), BASIC first creates a COPY of the data in a conventional string and then passes that instead. When the subprogram finishes, BASIC copies the data back into the original fixed-length string.

Passing fixed-length arrays is another matter entirely, however. To do this, you must declare the array to be a user-defined TYPE, and then refer to the type in the subprogram. The program listing TYPE .BAS in Figure 1 below demonstrates this.—Ethan Winer

```
TYPE FLen
  Stuff AS STRING * 11
END TYPE

DECLARE SUB FLSub (Param() AS FLen)
DIM A(100) AS FLen

A(89).Stuff = "Testing #89"
CALL FLSub(A())

SUB FLSub (Array() AS FLen)
  PRINT Array(89).Stuff
END SUB
```

Figure 1: An example showing how to pass a fixed-length string array to a subprogram.

A TOUCH utility in C that can update or change the date and time of an existing file

When I received a TOUCH program written in C from Todd Lindberg, I thought, "Too bad. Michael Mefford's TOUCH.COM was just published in the Utilities column (*PC Magazine*, April 12, 1988)." But on second thought, I realized that this program would make a good example. A useful utility, it requires about 150 lines of C source code (Figure 2), compared with 500 to 600 lines of assembler code. And while the .EXE file it creates is much larger than its .COM file counterpart, it's still fast and even more useful. Size isn't as critical as speed and ease of modification with a utility like TOUCH.

This C version of TOUCH can update or change the date and time of an existing

■ LANGUAGES

file. Alternatively, it can create a new file with any date/time stamp. It's extremely helpful when used with MAKE (a topic well covered by Mefford in his article).

I added the same command-line arguments as Mefford's utility to Mr. Lindberg's program, so you can pass it a specific date and time. The order of the arguments differs somewhat, however. The syntax is

```
TOUCH [/mm/dd/yy] [/hh:mm:ss] filespec
```

Since Mr. Lindberg designed the program to "touch" a list of files, wildcards included, it was easier to place the date and time switches first, with the filename arguments after them.

The wildcards are handled by the Microsoft C wildcard expansion function `_setargv()`, which is contained in `SETARGV.OBJ`. This function expands the arguments in the command tail, setting up argc (the argument counter) and argv (the array of argument pointers) for your program. Link this module into the program by invoking the compiler with

```
CL TOUCH.C SETARGV /LINK /NOE
```

The `/NOE` option instructs the linker to ignore extended dictionaries.

Ordinarily, if the linker decides that function A depends on function B, it makes a second pass through the library to find function B's code. This slows down

the link time. The extended dictionary, however, tells the linker this information up front, so when it loads function A, it looks at the dictionary, sees that function B is required, and loads it right then, avoiding the second pass. Extended dictionaries are one of the reasons why the link time improved so dramatically with the release of the 5.0 compiler.

But the linker gets confused if one of the modules you're linking (such as `SETARGV.OBJ`) includes a redefinition of a standard library function (such as `_setargv()`). So using `/NOE` overrides the extended dictionary searches—a slower link, but the confusion is avoided.

If you want your programs to always

```
/*
 * For NEC 5.0/QuickC: cl touch.c setargv /link /NOE
 */
#include<conio.h>
#include<ctype.h>
#include<stdlib.h>
#include<string.h>
#include<time.h>
#include<errno.h>
#include<fcntl.h>
#include<sys/types.h>
#include<sys/stat.h>

#define ERROR
#define TOUCH (/mm/dd/yy /hh:mm:ss) <filename> <filename...>
#endif

main(argc,argv)
int argc;
char *argv;
{
    int i, hdl;
    char *date = NULL, *time = NULL;
    struct utimbuf *utimes; /* tptr */
    extern int errno;

    if (argc < 2) /* if no filenames passed, print usage message */
    {
        printf("\nusage: touch (%s) (%s) <filename> <filename...>\n", TOUCH, TOUCH);
        exit(1); /* set errorlevel to 1 */
    }

    /* process any switches, only allowed in argv[1] and argv[2] */
    for (i = 1; i < 3; i++)
    {
        if (argv[i][0] == '/') /* slash found? */
        {
            if (toupper(argv[i][1]) == 'D') /* if date string */
                date = argv[i][2];
            else if (toupper(argv[i][1]) == 'T') /* if time string */
                time = argv[i][2];
        }
    }

    /* if date or time switch set, set ptr to times structure */
    if (date || time)
    {
        convert_date_time(&date, &time);
        utimes = &date;
    }
    else
        utimes = (struct utimbuf *)NULL; /* else to NULL */

    /* increment argv and decrement argc
     * if either date or time switches are on */
    if (date)
    {
        argv++;
        argc--;
    }
    if (time)
    {
        argv++;
        argc--;
    }

    /* process each filename passed */
    for (i = 1; i < argc; i++)
    {
        if (otimes(argv[i], utimes) == ERROR) /* unable to update the time */
        {
            switch (errno) /* print appropriate error message */
            {
                case EACCES:
                    printf("\ntouch: Directory or read-only file: %s", argv[i]);
                    break;
                case EINVAL:
                    printf("\ntouch: Bad time argument changing %s", argv[i]);
                    exit(1);
                case ENFILE:
                    printf("\ntouch: Too many open files (check FILES= in CONFIG.SYS)");
                    exit(1);
                case ENOENT:
                    /* if file doesn't exist, create it */
                    if ((hdl = open(argv[i], (O_WRONLY | O_CREAT, S_IRWRT)) == -1)
                        || print("\ntouch: Unable to create %s", argv[i]))
                    {
                        close(hdl);
                        continue;
                    }
                    break;
            }
        }
    }
    exit(0); /* set errorlevel to 0 */
}

/*
 * This function places date and time values in the datestr and timestr
 * pointers into a tm structure, overriding the current time.
 */
convert_date_time(struct utimbuf *utimes, char *datestr, char *timestr)
{
    struct tm *current_time;

    time(&time_t); /* get current time */
    current_time = localtime(&time_t); /* get pointer to it */

    /* if date passed, put it into place */
    if (datestr)
    {
        current_time->tm_mon = (get_date_time(&datestr) - 1);
        current_time->tm_mday = get_date_time(&datestr);
        if (current_time->tm_year >= 1980)
            current_time->tm_year -= 1980;
    }

    /* if time passed, put into place */
    if (timestr)
    {
        current_time->tm_hour = get_date_time(&timestr) - 1;
        current_time->tm_min = get_date_time(&timestr);
        current_time->tm_sec = get_date_time(&timestr);
    }

    datestr = modtime = mktime(current_time); /* place in time_t */

    /*
     * This function takes a pointer to a date or time pointer, gets the
     * next place of the date or time string and returns it as an integer
     * value. It advances the date or time pointer to point to the next
     * place available.
     */
    int get_date_time(char **ptr)
    {
        char phrase[15];
        char *p;

        strcpy(phrase, *ptr); /* copy the current string */
        if (p = strchr(phrase, '/')) /* find next separator and set to NULL */
            *p = NULL;
        else if (p = strchr(phrase, ':'))
            *p = NULL;
        else
            *p = '\0';

        if (*ptr == strlen(phrase)) /* advance pointer to next component */
            (*ptr)++; /* if a separator, move past it */

        return atoi(phrase); /* return the current component */
    }
}
```

Figure 2: This C program can update or change the date and time of an existing file.

expand the wildcards in the command tail, you can add SETARGV.OBJ to your library permanently with the LIB program. To do this, use the following commands:

```
LIB mLIBCE - SETARGV,,
LIB mLIBCE +SETARGV,,
```

Replace the model placeholder *m* with S, C, M, L, or H, depending on what memory model you're using (small, compact, medium, large, or huge). While this change will make your programs slightly larger, command-line wildcards will always be expanded.

The Microsoft runtime library provides a number of facilities for manipulating dates and times, but the `time()` function can set the date and time of a file (including opening and closing the file) in one fell swoop. The date and time of the filename passed to it are set to the value stored in a structure type called `UTIMBUF`, which consists of two long ints or `TIME_T` types. Only one of these is used on DOS systems—the other is for Unix compatibility.

The real work of setting up the date and

time is done in `convert_date_time()`, which breaks down the components of the command-line date/time strings and uses them to override the current system time (if either is omitted, the components are left set to the system time). The `time()` function sets the mod-time member of the `UTIMBUF` structure to the system time, and the `localtime()` function returns the address of an internal static buffer containing the time in the form of a `TM` structure. The `TM` structure contains members corresponding to the individual date/time components: month, day, year, etc. Then, the `mktime()` function converts the resulting value of the `TM` structure back to a long int at the end of `convert_date_time()`.

To get and set the values of these components, I wrote the `get_date_time()` function to retrieve the next component from the string and return it in integer form. Note that it uses double indirection, so that the pointer whose address is passed is always ready to access the next component of the string.—Richard Hale Shaw

Regain a Turbo Pascal 3.0 feature that got lost in Versions 4.0 and 5.0

If you've written a program with several numeric inputs, and it loops to allow recalculating with new inputs, it's convenient to hit Enter for those inputs that don't need to change. This was possible with Turbo Pascal 3.01 but not with 4.0.

After converting an old 3.01 program to 4.0, I found it very exasperating having to reenter five or six 7-digit numbers. I started to do something about it and ended up with a series of functions, identical except for the argument type. I named the functions `Realln`, `Intln`, `Wordln`, `Longintln`, `Extendedln`, and `Stringln`. In the demonstration program I use only the `Realln` and `Stringln` functions. `Stringln` is the one that is slightly different. To get the other ones, just change the name of the function (don't forget the assignment line at the end of it) and change the type declaration `Real`, wherever it occurs, to the new type.

The program `DEFAULT.PAS`, shown

```
PROGRAM DefaultDemo;
(*by Knut Fogelqvist, MoIndal, Sweden.*)

VAR
  Length, Width, Height, Volume : Real;
  UnitString : STRING;

FUNCTION Realln(Default : Real) : Real;
(*Input Real number, return Default if
user just pressed Enter. Can easily
be modified to use a different numeric
type, e.g. Extended, Double etc*)
VAR
  NewIn : STRING;
  Stat : Integer;
  Temp : Real;
BEGIN
  REPEAT
    Temp := Default;
    Stat := 0;
    ReadLn(NewIn);
    IF NewIn <> '' THEN
      Val(NewIn, Temp, Stat);
    IF Stat <> 0 THEN
      BEGIN
        Write($?, 'Error: erroneous input, character no ');
        Write(Stat:2, ', write again! ');
        END;
      UNTIL Stat = 0;
      Realln := Temp;
  END;

FUNCTION Stringln(Default : STRING) : STRING;
(*Input a string, return Default if user
just pressed Enter*)
VAR NewIn, Temp : STRING;
BEGIN
  Temp := Default;
```

```
  ReadLn(NewIn);
  IF NewIn = '' THEN
    Stringln := Temp
  ELSE
    Stringln := NewIn;
END;

BEGIN
  (* Here initial default values are assigned to
the variables used in the example, which just
compute the volume of a box. *)
  Length := 100.0116441;
  Width := 51.02188781;
  Height := 9.072974998;
  UnitString := 'centimeter';
  REPEAT
    Write('Length of box = ', Length:15:5, ' ');
    Write(UnitString, '. New length = ');
    Length := Realln(Length);
    Write('Width of box = ', Width:15:5, ' ');
    Write(UnitString, '. New width = ');
    Width := Realln(Width);
    Write('Height of box = ', Height:15:5, ' ');
    Write(UnitString, '. New height = ');
    Height := Realln(Height);
    Volume := Length*Width*Height;
    WriteLn;
    Write('The Volume is = ', Volume:15:5);
    WriteLn(' cubic ', UnitString, '.');
    WriteLn;
    Write('Unit = ', UnitString, ' (and this ');
    Write('program with "end"). New unit = ');
    UnitString := Stringln(UnitString);
    WriteLn;
  UNTIL UnitString = 'end';
END.
```

Figure 3: If you just press Enter, the function `Realln` retains the previous value.

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in Figure 3, clearly shows how to use the functions, so there should be no problem. If you run the program you will find that a new input will change the default value, while by merely pressing the Enter key you will leave it unchanged.—*Knut Fogelqvist; Molndal, Sweden*

Note that as a side benefit, the Realln function traps invalid numeric input. It beeps, warns of the error, and lets the user try again. Any program that takes numeric input ought to have at least this much validity checking. Otherwise, if a user enters the number "1234m567" your whole program may crash.

It would be very nice if the old value appeared on the input line when you hit the Enter key. However, you would need an even more sophisticated input routine to do that, one that would read each keystroke with ReadKey and process it.—*Neil J. Rubenking*

Determining space used by files with Microsoft C

Sometimes, I need to know how many bytes are used by a file or group of files. This is the opposite of the DOS DIR command, which will display how much space

is unused. By using the low-level functions available with the Microsoft 5.0 C compiler, I wrote USED.C, shown in Figure 4. To execute the program, enter the command

USED filespec

where *filespec* is the file whose size you want to determine and can include wildcards. When used on itself, USED will print the following result:

USED.EXE uses 7281 bytes

—*Gary Gruber; Bermuda Dunes, California*

The `_dos_findfirst()` and `_dos_findnext()` functions in the Microsoft C 5.0 and QuickC libraries are a welcome addition. Previously, programmers had to purchase libraries or write their own versions in assembler, which meant using two different sets of Int 21h calls. There's an additional benefit. By using the functions provided by the Microsoft 5.0 compiler, your source code will be portable to OS/2. This is because all of the `_dos_` function services have equivalents in the OS/2 C compiler library.

You can also be assured the Microsoft functions are written in assembler and are probably as fast and as small as you could

```
/* used.c
 * calculates total bytes occupied by filespec passed on command line
 * if no parameter is passed, defaults to *.*'
 */

#include <dos.h>
#include <stdio.h>

main(argc,argv)
int argc;
char *argv[];
{
    struct find_t specsUsedBy;
    long total = 0L;

    if (argc < 2)
    {
        printf("\nUsage: used <filespec>\n");
        exit(1);
    }

    if (! _dos_findfirst(argv[1], A_NORMAL, &specsUsedBy))
        total = specsUsedBy.size;

    while (! _dos_findnext(&specsUsedBy))
        total += specsUsedBy.size;

    printf("\n%s uses %ld bytes\n",argv[1],total);
}
```

Figure 4: Use this C program to determine the space used by a group of files.

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want (without writing them yourself). I generally prefer the functions that can be found in the Microsoft library to those of third-party suppliers on the basis of their reliability, code size, and speed.—*Richard Hale Shaw*

An easier way to input long data statements

I sympathize with Derek Howard's plight in typing *PC Magazine's* BASIC program listings (PC Tutor, November 10, 1987). I use a combination of the KEY and AUTO statements, shown in Figure 5, to facilitate entering long sequences of DATA items. After the initial portion of the program has been entered, I first press the NumLock key and then use the F9 and F10 keys to enter all of the DATA statements and comments automatically.—*Robert E. Nine; Fairfax, Virginia*

We receive many submissions regarding the problem of entering DATA statements for *PC Magazine's* utilities, but this one is the simplest and most effective yet. Type the commands in Figure 5 from BASIC's immediate mode when you are ready to begin entering the DATA values. Then press F9 after each number is typed with the nu-

you could omit the CHR\$(9) tab character and add an extra space after the comma instead.—*Ethan Winer*

```
KEY 10, CHR$(13) + " DATA "
KEY 9, ",", " + CHR$(9)
AUTO 200
```

Figure 5: A simplified method for entering many DATA statements in BASIC.

■ Combined KEY and AUTO statements can facilitate entering long DATA items.

meric keypad, and press F10 at the end of the line.

If the lines being entered are very long,

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PC TUTOR



Why IBM BASIC won't run on PC clones; restoring your hard disk to bootability; the difference between the 386SX and 80386 chips.

The 386SX chip is more than a variant of the 80386: it's a world of hope for 80286 owners

Thanks for your discussion of various microprocessors and their suitability for multitasking (PC Tutor, September 13, 1988). I hope you will extend that discussion to the "388" processor, the 16-bit version of the 80386, used in Compaq's Deskpro 386S machine.

I suspect that there will be add-in cards with that chip fairly soon, and for those of us with AT-class machines, it may look tempting. It would be nice to know what it won't do for us before we find out the expensive way.—Joan Lewis; Boston, Massachusetts

The 386SX microprocessor is simply a modified version of Intel's famous 80386 chip. Like its big brother, the 386SX is a full 32-bit, no-holds-barred computing machine. It executes the full 80386 instruction set, runs at clock speeds of up to 16MHz, and (in a properly designed system board) can access the same 4 gigabytes of real memory. The only significant difference between the two chips is the width of the external bus and the price.

Complex microprocessors like the 80386 are not a single circuit. They actually comprise several different functions, or modules, and are built on a single chip for speed, cost, and convenience. These modules communicate with each other over a group of connections known as the internal bus. In the 80386 and 386SX, this internal

bus is the same size—32 bits wide. As far as internal computations are concerned, the chips are identical.

When it comes to communicating with the outside world, this is where the two chips differ. The 80386 has separate 32-bit data and address paths. A full set of 32 pins is dedicated to carrying data to and from the chip. This is known as the external data bus. (Another 32 pins are used to select the address in memory, and other pins are used for timing and signaling, but we'll stick to an overview here.)

The 386SX, on the other hand, provides only 16 pins to carry the same 32 bits of data. How does it do it? Instead of transferring 32 bits in a single operation, the chip breaks the move down into two sequential 16-bit transfers. This is exactly the same type of operation that occurs in the 8088 chip in PCs and XT's. The 8088 is a 16-bit chip trapped in an 8-bit body: 16-bit data is moved in two 8-bit transfers.

The main disadvantage of using a reduced external bus size is loss of data transfer speed, which is known as throughput. Transferring the same data in two transfers instead of one incurs roughly twice the overhead, so the efficiency of operation drops. Fortunately, our PCs spend about 95 percent of their time waiting for us, so we generally have power to spare. So from a software point of view, what will the 80386 do that the 386SX won't? Nothing.

While new computers based on the 386SX will provide 386 computing power at a slightly lower cost than a full 80386 design, I think the consumer is being

charged a premium for the novelty of this new chip. The manufacturer's cost for the 386SX is about \$200 more than for an 80286—far smaller than the difference in street prices for two equivalent PCs based on these two chips.

The most pivotal application for the 386SX, as I see it, is as an add-in brain transplant for our 80286-based dodos. I generally frown on the use of accelerator cards and feel that a system board specifically designed for a chip is a better and more reliable solution for most users. But several configurations of 386SX cards that may change my opinion and hold a lot of promise for PC users are on the way.

These "transmuter" cards will probably appear in two forms. The first will be a small card that plugs into the 80286 socket either directly or with a cable. It won't require an expansion slot. The card will contain a 386SX chip and some interface circuitry needed to make it compatible with the 80286 I/O specifications. While it won't change the speed of your AT, it will give you full 80386 software compatibility for a minimum investment.

The second type of card will resemble today's accelerator cards, will include the 386SX and additional memory, and will fit in a 16-bit slot.

What's the advantage? The 80386-based boards require external circuitry to breakdown a 32-bit transfer to two 16-bit transfers. The 386SX already includes that circuitry—built right into the chip. The bottom line is a simpler, cheaper card. The advantage is the buyer's.

Proponents of the 80286 (the chip man-

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ufacturers, really) claim that a computer built around the 386SX chip holds no advantage, since there is no software to take advantage of it. This simply isn't true. Less than a year after the first 80386 computer was introduced, software was available that used the chip's unique properties to perform memory paging and implement virtual-86 mode.

If you can afford to buy a PC that uses the 80386 and its larger 32-bit external data path, then you will gain some speed over a PC built around the 386SX. If you can afford to wait for a 386SX transmuter card, then do so. Adding one of these transmuter cards to an 80286-based AT will give you the ability, for a nominal cost, to run 80386-based software right out of the box. Within the next year, as prices drop, watch the 386SX market for new PCs at bargain prices. But until the novelty wears off, a 386SX PC is an expensive curiosity.

The battery inside your PC AT plays an important role in daily computing

Ignoring battery power for a real-time clock, why do some PCs need another battery in order to function? At least, that's my impression. I saw a Wyse PC go bonkers when its battery died, yet I'm not aware of a battery in my Compaq.—*Bob Marik; Clarendon Hills, Illinois*

The PC and PC-XT both relied on DIP switch settings for their configuration information. When the AT was introduced, it stored configuration information in a small CMOS (complementary metal-oxide semiconductor) memory buffer. CMOS chips belong to a special type of logic family that uses very little power when idle. The stored configuration information is retained when the AT power is off by using a small battery. Most 80286 and 80386 machines contain such a battery, while PCs and XT's do not.

The life of the lithium batteries used in most premium computers is about 3 years. Cheaper clones that use normal AA batteries can expect a life of about 1 year. As the batteries start to lose their ability to maintain the CMOS memory area, the data can

be corrupted. Each time the AT is turned on, the BIOS uses a checksum to verify that the configuration information is still valid. If not, an error is displayed and a set-up program must be run. The batteries, of course, should also be replaced.

Productivity Tip

Having to set parameters and options each time you execute a program can be quite inconvenient. However, many programs provide a means to configure themselves automatically each time you start them. By making use of variables in the DOS environment, you can save yourself time and increase productivity.

Word processors and utility programs often make use of the TEMP variable to determine where to store temporary files. Directing this to a RAMdisk can speed up editing and file operations significantly. Not all programs take advantage of the environment, so check your user manual.

Restore a hard disk to bootability after erasing too many files

I ran into trouble while cleaning up the root directory of my hard disk. I went too far with the ERASE *.* command. Now I can't boot from the hard disk. All the data still operates when I boot from the floppy. The error message I get says "Bad or missing command interpreter."

Do I have to reformat the hard disk or is there some way to restore the COMMAND.COM, or whatever, to get the hard disk to boot? I'm still in the learning process when it comes to PCs, and my manual isn't much help.—*Robert M. Loflin, Jr.; Lynchburg, Virginia*

Consider yourself lucky. Restoring your hard disk to bootable status is simply a matter of a few easy steps. First, boot up the computer with the floppy drive. Then, at the A> prompt, enter the command

```
COPY COMMAND.COM C:\
```

Open the floppy drive door and reboot your computer.

What we commonly refer to as DOS actually consists of three files. The first two

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■ PC TUTOR

files are hidden and do not appear in the file directory of the disk. Although they can be seen with special file-handling programs, like the *Mace Utilities*, they are protected from most normal DOS file commands such as COPY, REN, and ERASE.

The third file is known as the command interpreter and is named COMMAND.COM. COMMAND has no special file properties and, as such, can be copied, renamed, and erased. Simply restoring the file from a backup or your original DOS disk can correct this error.

To prevent this from happening again, you may wish to protect the file COMMAND.COM by making it read-only. You can do this with another DOS command, ATTRIB, as follows:

ATTRIB +R COMMAND.COM

Introduced in DOS 3.0, ATTRIB lets you set some of the file attributes. DOS will not allow a read-only file to be erased.

For more versatility than ATTRIB allows, try the *PC Magazine* utility ATTR. It lets you set all four attributes: hidden, system, read-only, and archive. A complete explanation of the program and file attributes appeared in the June 10, 1986, *PC Magazine* Utilities column.

IBM BASIC won't run on non-IBM PCs, but there are alternatives

Is IBM's BASICA really that hardware-sensitive or does it simply test for a "True Blue" machine before locking up? Is there a patch to BASICA that will allow it to run on compatibles? I'm running PC-DOS 3.3 on a Zenith 286.—Robert Scola; Issaquah, Washington

When the IBM Personal Computer was introduced in 1981, no one really knew if anyone would buy it or what people would do with it. To be on the safe side, IBM tried to cover the home-computer market by making the machine functional without disk drives. A severely limited version of Microsoft BASIC (known as cassette BASIC), was embedded in read-only memory (ROM) chips and built right into the PC as hardware.

The BASIC and BASICA (BASIC Ad-

vanced) files included on IBM DOS distribution disks contain enhancements and additions to the cassette BASIC that is assumed to reside in ROM. The disk BASICS use the ROM BASIC as a type of subroutine library and therefore must have access to the ROM BASIC to function. Using the IBM files on a clone will cause the program to try to execute "empty space" and crash.

There's no patch that will let IBM BASIC run on a non-IBM machine. You can, however, purchase the complete BASIC interpreter as a program that will run on any PC compatible. The program is known as GW-BASIC and is usually available from the clone manufacturer.

As an alternative, you may wish to consider purchasing a BASIC compiler such as QuickBASIC or Turbo Basic. These development environments cost no more than the interpreter, and they provide better speed, editing, and performance, as well as support for structured programming.

Productivity Tip

The adoption by IBM of the 3½-inch diskette caused a lot of problems for PC users exchanging files. It also prompted the purchase of 3½-inch diskettes in bulk from discount dealers. Buyers of diskettes certified for use when formatted to hold 720K often balked at the price of diskettes rated for 1.44MB use. So, many 720K diskettes have been recast in 1.44MB roles. Some 3½-inch drives contain hardware that will not format these diskettes at the higher capacity. Check them out in your PC before buying a large quantity.

Ask the PC Tutor

The PC Tutor solves practical problems and explains points of general interest about using your hardware and software more productively, and answers basic questions about DOS and systems in general. To see your questions answered here, drop a line to PC Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016. We're sorry, but we cannot answer questions personally.

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NOVELL: BTRIEVE, XQL, XTREIVE

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Btrieve a multi-lingual, also. It includes more than 30 languages and dialects (including C, BASIC, PASCAL, FORTRAN). However if it turns out that you are using something a little unusual, worry not. The manual includes a chapter on how to write a language interface to Btrieve.

Btrieve's vital statistics are equally impressive. Files may have up to 24 indexes, fixed record length to 4000 characters, variable length to 64K, pointers to 255 characters, files of 4 billion bytes. Network support includes Novell, 3-COM, IBM PC NET, Software Link's Multinet and many others.

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records could have been used to program more important parts of your application. Why not let XQL do it for you? XQL will increase your programming productivity and let you focus on building better applications.

The XQL system works in tandem with Btrieve and has an equally powerful chassis. No limit on the number of records per file. Max file size is 4 Giga-bytes. Max record size equals 4K. Max indexes per file is 24. The one version works for single or multiuser systems, DOS Ver 3.0 or greater. All languages are supported.

Xtrieve is the final ingredient in the Novell programming recipe. It is a menu driven, data retrieval system, that allows you to quickly find information and display reports. System developers can easily customize Xtrieve to display command menus, help files, and error messages in the English spoken by the customer. Xtrieve screens then gives menu choices that users can quickly recognize, making Xtrieve an easy product to use and understand.

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AD CODE NO. 11B27

CONNECTIVITY CLINIC

```

NOV 01 099
127 118
POP 02
POP 02
DNC 02
JMS MAILH
RTT
ERROR 000 0000

```

```

MAIL_CODE 0000
MAIL_STACE 00 1000 000 (7)
MAIL_STACE 000 0000
DEFAULT STACE

```

(Figure 1 ends)

The syntax for EXPORT.EXE is

EXPORT <receiver name> redirection symbol
<from device name>

If you entered the statement

EXPORT Frank < data.bin

EXPORT would send data.bin to Frank through the NetBIOS modules of the sending and receiving node.

EXPORT.EXE expects to send files. So if you send messages redirected from the keyboard (CON), end your messages with two Ctrl-Z Enter sequences like

```

EXPORT FRANK < CON
Did you remember to bring the doughnuts today?
^Z
^Z press Enter
^Z press Enter

```

The first Ctrl-Z Enter sends the message and the second one clears the buffer to terminate EXPORT.EXE.

Error messages from these programs are in hex. Here are the most common errors you will see:

```

$0N Duplicates name in local name table
14H Cannot find name called or no answer16H
Name in use elsewhere on network

```

Understanding how data moves between nodes in a network may sound tough, but it isn't. Experimenting with these programs will help you to learn more about NetBIOS services. Once you've grasped these services, you'll understand how to use newer protocols that follow the OSI (Open System Interconnection) model,

and exotic ones, such as TCP/IP.

But remember, not all PC-based LANs use NetBIOS. NetBIOS program modules are always present in every node in a LAN that uses IBM's *PC Local Area Network Program*. LAN software running under DOS often provides NetBIOS services, but not always. DCA 10Net, for example, only recently added NetBIOS services to the latest version of its software.

Unlike IBM's *PC LAN*, Novell's *NetWare* and Banyan's *VINES* don't use NetBIOS as a primary interface between the LAN software and the network adapters. They emulate NetBIOS services through special programs that must be started by the network administrator.

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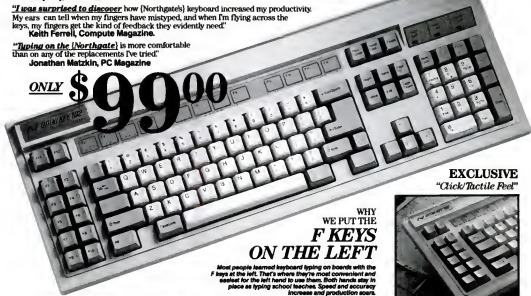
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■ CONNECTIVITY CLINIC

In Novell's *NerWare*, you invoke the NetBIOS emulator simply by typing NETBIOS at the command line in the PUBLIC.SYS directory. Novell's emulator operates on top of its *Interwork Packet Exchange* software, which performs many of the functions for *NerWare* that NetBIOS does for IBM's PC LAN. The emulator doesn't generate packets like NetBIOS, but it receives requests from programs making NetBIOS calls and passes them to IPX (Internetwork Protocol Exchange) or other appropriate software modules.

Setting up NetBIOS services in Banyan's *VINES* takes several minutes. You need to be a Banyan school graduate and have the manual in your lap. Once it is installed, however, NetBIOS is available to programs running on *VINES*'s nodes.

NETBIOS AND LAN MANAGER *LAN Manager* is the name for Microsoft's OS/2-based networking software. Dozens

of companies will buy *LAN Manager* from Microsoft and remarket it. Regardless of the implementation you use, *LAN Manager* will support NetBIOS applications.

IBM is pushing to replace many of the NetBIOS communications session functions with their Advanced Program to Program Communications architecture. But NetBIOS is more practical than APPC in PC-based LANs. *LAN Manager* includes a higher-level interface to NetBIOS services, Named Pipes, which includes the security validation and auditing features missing from NetBIOS and creates a simpler programming interface.

Instead of blowing away in the winds of progress as IBM had planned, NetBIOS is getting healthier. The presence of *LAN Manager* in the marketplace will help standardize NetBIOS implementations and make it easier to design applications.

Don't be afraid to install communications gateways, electronic mail systems,

or other products that depend on NetBIOS. One of the rapidly growing categories of NetBIOS-dependent packages lets one node link to the keyboard and screen of another node on the LAN. New uses for NetBIOS are emerging every week.

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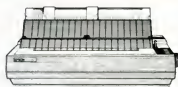
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- Exclusive SelectType front control panel puts popular printer features and SmartPark operations at your fingertips.
- The FX-850 prints 264 characters per second (CPS) in high-speed draft mode (12 CPI); 54 CPS in Near Letter Quality mode (12 CPI).



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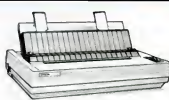
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Epson LQ-850

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- In draft mode or Letter Quality mode, the LQ-850 runs at a surprisingly quiet 55 dB noise level



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- Epson's 24-pin, dot-matrix technology creates true letter quality characters
- Epson's SmartPark™
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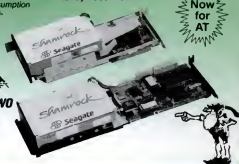
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SPECIALS

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The Toshiba T1000 is the perfect second PC! It comes with 512K of ram, a 720K floppy drive, a supertwist LCD screen and MS-DOS in rom! All this in a battery-powered 7 pound package. A 768K ram card is just \$269 and can be set as base, expanded, or a non-volatile ram disk.

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180D	259	165
MSP40	299	299
Tribute 124	599	429
Tribute 224	599	599
Diconix		
150P	499	299
Epson		
DL3400	995	549
Fujitsu		
P2200	569	339
P2200	799	509
P5300	1049	609
LC890	4799	349
Okidata		
182 Plus	319	219
320	499	329
390	699	469
393 (Rig Interface)	1399	915
Panasonic		
KXP1080-2	299	159
KXP1091-2	329	185
KXP1124	529	319
KXP1585	749	419
KXP1524	949	519
Star		
NX1000	269	169
NX2400	499	319
NB2410	699	449
Toshiba		
P321SL	749	459
P341SL	999	629
P351SL	1499	929

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BOARDS		FAST
AST	LIST	319
Hot Spot 286	645	339
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1200B Int Modem	149	69
2400B Int Modem	249	129
Genoa		
Super EGA H-Res+	399	169
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VGA H-Res #5200	645	359
Hercules		
Graphic Card +	299	169
Intel		
8087-2	250	149
80287-10	480	249
Above Board Plus	795	459
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Autoswitch 480	349	169
VGA Plus	399	259
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VGA Professional	799	459
Practical Peripherals		
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Promodem 2400G	249	159

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USRobotics		
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1200 Baud External	179	89
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2400 Baud External	279	179
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Fast Write VGA	549	335
Vega Deluxe	379	189
Vega VGA	499	259
V-RAM VGA	899	599
LAPTOPS		
Mitsubishi		
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MP-286L 20mb	4595	2449
NEC		
Multispeed EL II	2295	1449
Multispeed HD	3695	2249
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T1200F	2099	1369
T1200BF Backlit	2399	1499
T1200HB Backlit	3599	2399
T1600	3699	2499
T3200	5799	3695
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NEC		
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Multisync Plus	1399	869
Princeton		
Mex15	369	249
Ultrasync	849	479
Ultra 16	1375	859
Sony		
1302 Multisync	995	599
1303 Multisync	825	479
Zenith 1490	999	599
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Miniscribe		
40MB AT #3650	499	319
Mitsubishi		
40MB AT MRS35 22ms	825	399
749		
20MB XT K# #225	599	269
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40MB AT #251-1	999	449
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RepFile	1295	779
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GEM Desktop Pub.	299	169
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BPI		
Computer Associates	99	59
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Managing Your Money	117	117
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Integrated		
First Choice	159	95
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Logitech C7 SerialBus	119	65
Logitech HiRes Bus	150	79
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Lotus	495	269
Lotus 3-D	149	79
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Desklink	170	95
Desview	130	73
Fastback Plus	189	99
FastFax	50	33
Format	95	54
Laplink Plus	140	77
Norton Advanced	149	74
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Sidekick Plus	195	119
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Battery Pack-Spec'd EL or HD 99	ALO 300 Color 16/24 pin 829/869	MITSUBISHI D-Scan 1371 449	SHARP UX-180 979
Carry Case EL/HD w/20 MB 1469	ALO 234E Color 599	With Tilt & Swivel 479	SHARP FO-240 1279
NEC 5.25" ECT 360K for HD 299	ALO 324E Color 749	SHARP UX-180 979	MURATA M1200/M1600 699/799
Floppy Modem 1200/2400 Int 269/339	BiD Tractor 200/300 70/90	NEC MultiSync II 1402 679	QUADRAM JT Fax 4800/9600 279/549
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T1200H, 26MB w/out CC 2169	P2100 w/Tractor 1079	TAXAN 770 750 w/Dance H/Rs 640	
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T1200H w/out Carry Case 3099	Color K4 5200/5300 109	With Zenith Tilt & Swivel 640	
T3100E w/out Carry Case 3999	Color K4 5200/5300 169/199	Zenith Tilt & Swivel 30	
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Won't Under Expansion slot for 1100 * 1200 or 3100/5100 209/270			
Floppy 5.25" ECT 360K 299/270			
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Memory 2MB T3100 669/640			
Memory 3MB T3200 1239/1200			
Memory 2MB T5100 1049/1020			
Modem 1200 Int 319/300			
Modem 1200 No Tilt 1200 299			
When installed 350			
Models T1000 * 1200/3100/5100 289/280			
Toshiba 1200 Int 289/280			
Megahertz 1200 Int w/sw 189/159			
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Prometheus 2400 Int w/sw 329/300			
Adaptamodem 2400 Int 329/300			
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Numeric Keypad T1000/1200 99/90			
Numeric Keypad T3100E 99/90			
Bookkeeper 99/90			
Bookkeeper Watch by Traveling sw 129/120			
Desk Link by Traveling sw 109/100			
Laplink Plus by Traveling sw 109/100			

SYSTEMS	PRINTERS	MONITORS	FAX MACHINES/BOARDS
NEC Multi-Speed EL II 1479	ALPS Allegro 24 pin 399	LOGITECH AutoSync with EGA Card. 609	PANAFAX UF-155 1049
Multi-Speed Hi w/20 MB 2299	ALO 200 Color 16/24 pin 439/469	LogiMouse & Paint Show 609	SHARP FO-220 979
Battery Pack-Spec'd EL or HD 99	ALO 300 Color 16/24 pin 829/869	MITSUBISHI D-Scan 1371 449	SHARP UX-180 979
Carry Case EL/HD w/20 MB 1469	ALO 234E Color 599	With Tilt & Swivel 479	SHARP FO-240 1279
NEC 5.25" ECT 360K for HD 299	ALO 324E Color 749	SHARP UX-180 979	MURATA M1200/M1600 699/799
Floppy Modem 1200/2400 Int 269/339	BiD Tractor 200/300 70/90	NEC MultiSync II 1402 679	QUADRAM JT Fax 4800/9600 279/549
TOSHIBA LAPTOPS	Ribbon ALO Black/Color 15/20	SONY 1311C-131 Trinitron Color 549	JT Fax Portable 339
T1000 w/out Carry Case 789	P2000 w/Tractor 679	Remote Tilt & RGB Monitor 449	THE COMPLETE PC Fax Bnd 4800/2600
T1000 w/Toshiba Carry Case 829	P2100 w/Tractor 1079	SONY 1303/2 to IBM Cable 30	Answering Machine-Voice Mail 239
T1000 w/Case & 766K Card 1129	P2400 Color w/Tractor 24 pin 969	SONY Multiscan 1303 629	
T1000 w/Floppy w/out CC 1299	* DICONIX Inkjet 150 parallel with 3' or 6' cable 309	SONY Multiscan 1302 649	
T1200B/F. Backlit w/out CC 1469	With any Laptop 279	SONY 1303/2 to IBM Cable 30	
T1200H, 26MB w/out CC 2169	P2100 w/Tractor 1079	TAXAN 770 750 w/Dance H/Rs 640	
T1200H w/Carry Case 2299	Color K4 5200/5300 515/669	ZENITH ZCM-1400 Flat Screen 619	
T1200H w/out Carry Case 3099	Color K4 5200/5300 109	With Zenith Tilt & Swivel 640	
T3100E w/out Carry Case 3999	Color K4 5200/5300 169/199	Zenith Tilt & Swivel 30	
T3200 w/out Carry Case 3399	* TOSHIBA 3215L 479 *	UNIVERSAL Tilt & Swivel 35	
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Carry Case for T1000 or T1200 80			
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Floppy 5.25" ECT 360K 299/270			
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Memory 2MB T5100 1049/1020			
Modem 1200 Int 319/300			
Modem 1200 No Tilt 1200 299			
When installed 350			
Models T1000 * 1200/3100/5100 289/280			
Toshiba 1200 Int 289/280			
Megahertz 1200 Int w/sw 189/159			
Megahertz 2400 Int w/sw 279/259			
Prometheus 1200 Int w/sw 149/139			
Prometheus 2400 Int w/sw 329/300			
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Laplink Plus by Traveling sw 109/100			

SYSTEMS	PRINTERS	MONITORS	FAX MACHINES/BOARDS
NEC Multi-Speed EL II 1479	ALPS Allegro 24 pin 399	LOGITECH AutoSync with EGA Card. 609	PANAFAX UF-155 1049
Multi-Speed Hi w/20 MB 2299	ALO 200 Color 16/24 pin 439/469	LogiMouse & Paint Show 609	SHARP FO-220 979
Battery Pack-Spec'd EL or HD 99	ALO 300 Color 16/24 pin 829/869	MITSUBISHI D-Scan 1371 449	SHARP UX-180 979
Carry Case EL/HD w/20 MB 1469	ALO 234E Color 599	With Tilt & Swivel 479	SHARP FO-240 1279
NEC 5.25" ECT 360K for HD 299	ALO 324E Color 749	SHARP UX-180 979	MURATA M1200/M1600 699/799
Floppy Modem 1200/2400 Int 269/339	BiD Tractor 200/300 70/90	NEC MultiSync II 1402 679	QUADRAM JT Fax 4800/9600 279/549
TOSHIBA LAPTOPS	Ribbon ALO Black/Color 15/20	SONY 1311C-131 Trinitron Color 549	JT Fax Portable 339
T1000 w/out Carry Case 789	P2000 w/Tractor 679	Remote Tilt & RGB Monitor 449	THE COMPLETE PC Fax Bnd 4800/2600
T1000 w/Toshiba Carry Case 829	P2100 w/Tractor 1079	SONY 1303/2 to IBM Cable 30	Answering Machine-Voice Mail 239
T1000 w/Case & 766K Card 1129	P2400 Color w/Tractor 24 pin 969	SONY Multiscan 1303 629	
T1000 w/Floppy w/out CC 1299	* DICONIX Inkjet 150 parallel with 3' or 6' cable 309	SONY Multiscan 1302 649	
T1200B/F. Backlit w/out CC 1469	With any Laptop 279	SONY 1303/2 to IBM Cable 30	
T1200H, 26MB w/out CC 2169	P2100 w/Tractor 1079	TAXAN 770 750 w/Dance H/Rs 640	
T1200H w/Carry Case 2299	Color K4 5200/5300 515/669	ZENITH ZCM-1400 Flat Screen 619	
T1200H w/out Carry Case 3099	Color K4 5200/5300 109	With Zenith Tilt & Swivel 640	
T3100E w/out Carry Case 3999	Color K4 5200/5300 169/199	Zenith Tilt & Swivel 30	
T3200 w/out Carry Case 3399	* TOSHIBA 3215L 479 *	UNIVERSAL Tilt & Swivel 35	
T5200B w/out CC 5999	* TOSHIBA 3415L 599 *		
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Battery Pack T1000 249/200			
Battery Back T1200 299/200			
Carry Case for T1000 or T1200 80			
Carry Case for T1200 T5100 149/100			
Designer Carry Case w/pockets for SW manuals, portable printer etc. Specify model 149/130			
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Won't Under Expansion slot for 1100 * 1200 or 3100/5100 209/270			
Floppy 5.25" ECT 360K 299/270			
Memory 766K 1100 299/290			
Memory 1MB T1200/T3100 599/570			
Memory 2MB T3100 669/640			
Memory 3MB T3200 1239/1200			
Memory 2MB T5100 1049/1020			
Modem 1200 Int 319/300			
Modem 1200 No Tilt 1200 299			
When installed 350			
Models T1000 * 1200/3100/5100 289/280			
Toshiba 1200 Int 289/280			
Megahertz 1200 Int w/sw 189/159			
Megahertz 2400 Int w/sw 279/259			
Prometheus 1200 Int w/sw 149/139			
Prometheus 2400 Int w/sw 329/300			
Adaptamodem 2400 Int 329/300			
World Port 1200 Ext 159/150			
2400 Ext w/AC Modems 259/250			
2400 Ext cable for 1600 modems 20			
Numeric Keypad T1000/1200 99/90			
Numeric Keypad T3100E 99/90			
Bookkeeper 99/90			
Bookkeeper Watch by Traveling sw 129/120			
Desk Link by Traveling sw 109/100			
Laplink Plus by Traveling sw 109/100			

*** TOSHIBA T1000 769 * LOTUS SYMPHONY 3.5" Ver 1.2 199 ***

SYSTEMS	PRINTERS	MONITORS	FAX MACHINES/BOARDS
NEC Multi-Speed EL II 1479	ALPS Allegro 24 pin 399	LOGITECH AutoSync with EGA Card. 609	PANAFAX UF-155 1049
Multi-Speed Hi w/20 MB 2299	ALO 200 Color 16/24 pin 439/469	LogiMouse & Paint Show 609	SHARP FO-220 979
Battery Pack-Spec'd EL or HD 99	ALO 300 Color 16/24 pin 829/869	MITSUBISHI D-Scan 1371 449	SHARP UX-180 979
Carry Case EL/HD w/20 MB 1469	ALO 234E Color 599	With Tilt & Swivel 479	SHARP FO-240 1279
NEC 5.25" ECT 360K for HD 299	ALO 324E Color 749	SHARP UX-180 979	MURATA M1200/M1600 699/799
Floppy Modem 1200/2400 Int 269/339	BiD Tractor 200/300 70/90	NEC MultiSync II 1402 679	QUADRAM JT Fax 4800/9600 279/549
TOSHIBA LAPTOPS	Ribbon ALO Black/Color 15/20	SONY 1311C-131 Trinitron Color 549	JT Fax Portable 339
T1000 w/out Carry Case 789	P2000 w/Tractor 679	Remote Tilt & RGB Monitor 449	THE COMPLETE PC Fax Bnd 4800/2600
T1000 w/Toshiba Carry Case 829	P2100 w/Tractor 1079	SONY 1303/2 to IBM Cable 30	Answering Machine-Voice Mail 239
T1000 w/Case & 766K Card 1129	P2400 Color w/Tractor 24 pin 969	SONY Multiscan 1303 629	
T1000 w/Floppy w/out CC 1299	* DICONIX Inkjet 150 parallel with 3' or 6' cable 309	SONY Multiscan 1302 649	
T1200B/F. Backlit w/out CC 1469	With any Laptop 279	SONY 1303/2 to IBM Cable 30	
T1200H, 26MB w/out CC 2169	P2100 w/Tractor 1079	TAXAN 770 750 w/Dance H/Rs 640	
T1200H w/Carry Case 2299	Color K4 5200/5300 515/669	ZENITH ZCM-1400 Flat Screen 619	
T1200H w/out Carry Case 3099	Color K4 5200/5300 109	With Zenith Tilt & Swivel 640	
T3100E w/out Carry Case 3999	Color K4 5200/5300 169/199	Zenith Tilt & Swivel 30	
T3200 w/out Carry Case 3399	* TOSHIBA 3215L 479 *	UNIVERSAL Tilt & Swivel 35	
T5200B w/out CC 5999	* TOSHIBA 3415L 599 *		
T5200-100MB w/out CC 6999	KENNINGTON Printer Stand 20		
ACCESSORIES for Toshiba Laptops	With Printer 10 *		
With Laptop Use Second Price	* FREE With Prepaid Printer Order		
AC Adapter T1000/1100 * 75/60			
AC Adapter T1200 99/80			
Auto Adapter T1000/1100 * 85/50			
Battery Charger T1200 239/210			
Battery Pack T1000 249/200			
Battery Back T1200 299/200			
Carry Case for T1000 or T1200 80			
Carry Case for T1200 T5100 149/100			
Designer Carry Case w/pockets for SW manuals, portable printer etc. Specify model 149/130			
Extension Chassis w/interleave for 1100 * 1100 * 1200 or 3100/5100 869/829			
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COMING UP

WARP SPEED You say you're not satisfied with the performance of 20-MHz 386 machines and you have deep pockets? You're in luck. *PC Magazine's* first roundup of 25-MHz 386 screamers includes nine of the fastest PCs ever made—and some of the most expensive we've ever evaluated. If you're a software developer or a user of a CAD or desktop publishing program that incorporates a lot of graphics, or if you want to use a 386 as a LAN file server, you just might find your next machine among this fast and powerful group.

SEE HOW THEY RUN Now that graphical user interfaces are gaining in importance, it might not be long before using a mouse becomes a necessity, not just for graphics and engineering applications but for typical business applications as well. With this in mind, PC Labs evaluates 18 mice, looking at how their manufacturers have refined such features as case design, resolution, and positioning control to make these devices as comfortable and accurate to use as a keyboard.

DISPLAYING POTENTIAL Is 8514 just more detritus in an industry already littered with competing video standards, or does it open the door to the kind of CAD-quality resolution you just can't live without? Contributing editor Winn L. Rosch examines both sides of this controversy and reviews 11 monitors from IBM and other manufacturers that offer the highest-caliber video performance your PS/2 has seen yet.

THE CACHE MACHINE If you use a database or any other application program that continually reads and writes to a hard disk, you can reduce the time DOS takes for both of those operations by a factor of 10 by using a disk-caching program. Which of the 13 disk-caching programs reviewed by contributing editor Edward Mendelson will save you the most time? Which offers the most functionality? Which is the safest to use? Our benchmark tests, features table, and in-depth reviews answer those questions and more.



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3. Is your company a reseller?

- i. ☐ Yes
- j. ☐ No

4. For how many IBM PCs and compatibles do you specify brands of products?

- k. ☐ 10 or less
- l. ☐ 11-25
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- n. ☐ 100 or more

5. Are there any PCs in your office? (Check all that apply.)

- a. ☐ Linked to mainframe
- b. ☐ Linked to mini
- c. ☐ Networked together

6. Does your company own

- r. ☐ Mainframe(s)
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7. Do you plan to buy any PC products?

- t. ☐ Now
- u. ☐ In 4 to 6 months
- v. ☐ In 6 to 12 months
- w. ☐ No definite plans

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AFTER HOURS



REFERENCE

Family Care Educates Parents About Childhood Illnesses And Accidents

BY DONALD B. TRIVETTE

Your child has a fever of 102 degrees. You call the doctor, and he asks a series of questions: "Has the child had convulsions?" "Is it difficult to bend the child's neck forward?" "Is there a rash that looks like blood under the skin?" After you answer no to these and other questions, the doctor concludes that the child is in no immediate danger and advises you to watch him closely for the next 24 hours.

The only unusual thing about this scenario is that the "doctor" is Lundin Laboratories' *Family Care*, a \$99 program created by three pediatricians. Parents should note that the program is most careful with the advice it dispenses; at any hint of a serious problem, it alerts you to contact your own physician.

Family Care's main menu lets you choose from among four categories: Accident, General Illness, Newborn, and Skin Problems. Under each of those headings you'll find lists of symptoms. Listed under General Illness, for example, are fever, crying, and 16 other prime symptoms. Once you've narrowed the complaint to a specific area, the program takes over and asks you questions.

To better assess the program's usefulness, I asked two

pediatricians to look at it.

The first doctor found a few important omissions. There is no "fever" symptom on the newborn menu, nor are sores or skin infections listed under skin problems. Under urinary problems, the program doesn't ask the gender of the child; it also doesn't ask if the child has recently had a bubble bath, an activity that often accounts for minor urinary problems in little girls. Even so, the doctor felt the package could be useful for educating parents.

The second pediatrician concurred that it was a good teaching tool, but he too found some omissions. In particular, he was disappointed by the lack of information on poisoning.

"Severe pain" is a key term that appears in many questions; if you answer that your child is experiencing this, the program

tells you to see a physician within 60 minutes. One of the pediatricians felt this wording might needlessly cause apprehension in some parents. However, in our litigious society it's not surprising that the developers might prefer to err on the side of safety.

Both doctors thought that a modified version of *Family Care* would be a big help for their nurses to use in answering parents' questions and screening calls. But will parents turn to a computer program in a real emergency? It seems doubtful. Not to worry yet, Dr. Welby.

List Price: *Family Care*, \$99.
Requires: 256K RAM, DOS 2.0 or later. Not copy protected. Lundin Laboratories Inc., 29451 Greenfield Rd., Southfield, MI 48076; (313) 559-4561.

CIRCLE 694 ON READER SERVICE CARD

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AFTER HOURS



FITNESS

The 8-Week Cholesterol Cure Offers Help in Fighting Heart Disease

BY WENDY HUANG

Disk-Count Software's \$39.95
The 8-Week Cholesterol Cure:
With the Help of Your Computer
is for Americans who put oat bran on everything from salad to Jell-O in an attempt to keep their cholesterol level down.

The 8-Week Cholesterol Cure is based on and accompanied by Robert Kowalski's book of that name. Used together, the two offer a way to reduce your risk of heart disease by lowering total cholesterol consumption to 200 milligrams daily.

You begin by recording your name, desired weight, and activity level in a Personal Goal Chart. You will also need to refer to charts in Kowalski's book to input the "ideal" number of calories you must consume and the cholesterol level you must maintain daily.

To compare your ideal daily cholesterol and caloric needs with your actual food intake, a blank menu is provided for you to enter the foods you eat. You can select foods from the pop-up food menu, which is a time-consuming process, or type

them into the worksheet. If you choose the latter method, the program will enter the closest match from its database.

You may notice that the food database is somewhat incomplete, especially when compared with the one in *Take Charge of Your Cholesterol* (After Hours, PC Magazine, April 26, 1988). For instance, when I entered "tea," "tofu dessert" appeared instead. You can get around this by adding other foods into the database.

Next you move into the Daily Analysis section. Here you are presented with a breakdown of the calories and cholesterol in the foods you have consumed versus your goal. This is a really useful feature, albeit a harsh one if you haven't been sticking to your plan.

The program lacks some important options. For instance, it does not keep an on-screen running total of all the cholesterol and calories you have accumulated since the first day of your diet, a truly motivational feature that *Take Charge of Your Cholesterol* does offer.

List Price: The 8-Week Cholesterol Cure: With the Help of Your Computer (including book), \$39.95. **Requires:** 384K RAM, DOS 2.0 or later. Not copy protected. Disk-Count Software Inc., 1751 W. Country Rd. B, #107, St. Paul, MN 55113; (800) 331-6902, ext. 77.

CIRCLE 666 ON READER SERVICE CARD

Personal Health Appraisal tells you how to reduce your health risks. If the program determines that you are at risk for a specific problem, it will refer you to Core Concepts in Health for information.



FITNESS

Personal Health Appraisal Pinpoints Risks to Your Well-Being

BY DONALD B. TRIVETTE

How many miles will you travel by motorcycle in the next 12 months? How many times per week do you eat fiber-rich foods? How often do you get into physical fights? Those are just some of the questions you'll have to answer for Labyrinth Research and Development's *Personal Health Appraisal*, a \$39.95 program designed to gauge the state of your health.

Although the program asks for some medical data, such as your blood pressure and cholesterol level, most of the questions relate to life-style: Do you often exceed the speed limit by 15 mph? Are you a smoker? There's even an optional section that questions you about your sexual behavior to see if you are at risk for AIDS.

Once you've completed the questions—about 40 in all—you get a health risk appraisal report. I was pretty relieved to hear that the program rated my health habits at 95 percent.

Personal Health Appraisal doesn't just report your risks: it

also tells you how to lessen them. Even though I got a high health rating, the program thinks I can still afford to lose 10 pounds, exercise more often, and reduce my blood pressure.

It would be nice to input several sets of data in one pass to see how risks change. For example, did I lose points because I stopped smoking 6 years ago? What if it had been 10 years? Or 15? The only way to find out is to rerun the entire program.

The fourth edition of *Core Concepts in Health*, an excellent 500-page health manual written by Drs. Paul M. Insel and Walton T. Ruth of Stanford Medical School, is included. If the program determines you're at risk for some reason, you can turn to the book—which covers everything from cardiovascular health to cancer to nutrition for further information.

Personal Health Appraisal goes a long way toward increasing your awareness of potentially risky activities. More important, it might motivate you to do something about them before it's too late.

List Price: *Personal Health Appraisal*, \$59.95 (including book). **Requires:** 256K, DOS 2.1 or later. Not copy protected. Labyrinth Research and Development, 528 Valley Way, Milpitas, CA 95035; (408) 945-0518.

CIRCLE 005 ON READER SERVICE CARD



You can enter the names of the foods you eat into The 5-Week Cholesterol Cure's daily menu by choosing selections from the pop-up window.



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AFTER HOURS

Nutrition Databases (continued)

As software, *The Food Processor II* is a pleasure to use. The uncluttered main menu gives way to easy-to-grasp screens that feature Lotus-style two-line menus. Filling in fields is greatly simplified by the program's extensive use of lookup tables.

The package does have a few flaws. It came up empty when I asked it about sushi, and I couldn't find a listing for cooked carrots, either. Some of the lookup table categories are a little strange: when I typed in "tea," I got a list of meats. And the general beverage category has exactly one entry.

List Price: *The Food Processor II*, \$250. **Requires:** 384K RAM, DOS 2.0 or later. Not copy protected. ESHA Research, P.O. Box 13028, Salem, OR 97309; (503) 585-6242.

CIRCLE 699 ON READER SERVICE CARD

Nutri-Calc PC

Camde Corp.'s *Nutri-Calc PC* costs \$145 and comes standard with a database of over 1,500 foods. An additional \$45 buys you a database supplement that brings the total number of foods to 3,000; that's the largest selection of the three databases that I looked at.

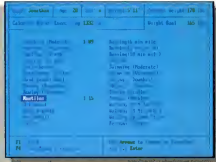
Though its interface is somewhat rougher and not as easy to follow as *The Food Processor*'s,

Nutri-Calc PC functions in much the same way. You compile a list of foods and then compare the nutritional and caloric content of the foods you eat with a target allowance. *Nutri-Calc* breaks down foods into 26 component nutrients, however, as compared with *The Food Processor*'s 30 nutrients.

In addition to this numerical analysis, *Nutri-Calc* offers two graphic views of your data. The first is a bar chart that basically resembles the one found in *The Food Processor*. The second is a visual representation of the percentage of caloric intake that is derived from protein, fat, and carbohydrates. While *The Food Processor* offers this information in numerical form, *Nutri-Calc*'s graph gives a better, more immediate understanding of how a diet is divided among these three basic caloric sources.

You can save the data from an analysis of a list of foods, but *Nutri-Calc* saves only the total for each nutrient in the analysis. A history file can be developed and then plotted to show dietary trends. Since foods and quantities are not saved, you have to print out a report to hang onto this information.

Nutri-Calc takes physical activity into account more thoroughly than does *The Food Processor*, which recognizes only a few very general levels of activity. A separate module of the



The Diet Balancer lets you easily include calories burned by exercise in your overall dietary plan.

program, called *Calorie-Magic*, analyzes your physical exertion and then develops a weight loss program. The package computes a maximum caloric consumption for each day during the projected diet, given the level of physical activity that you have planned.

List Price: *Nutri-Calc PC*, \$145. Database supplement, \$45.

Requires: 320K RAM, 384K and hard disk for database supplement, DOS 2.1 or later. Not copy protected. Camde Corp., 4435 S. Rural Rd., #331, Tempe, AZ 85282; (602) 821-2310.

CIRCLE 698 ON READER SERVICE CARD

The Diet Balancer

At \$79, *The Diet Balancer* is the least expensive of the nutrition and diet packages considered here. The database lists over 1,600 foods, and like the other packages, the program lets you add information for other foods as you see fit. As with the others, you begin by entering a profile of descriptive information about yourself.

The Diet Balancer allows for the most detailed exercise planning of the three programs, with a decided emphasis on weight adjustment. It asks you if you want to alter your weight, inquires about your general level of activity, and prompts you to choose from a menu of various exercises. The software then calculates your caloric and nu-

tritional requirements, based on your desired weight and the other details of your profile. This entire process is menu driven, as is most of the program.

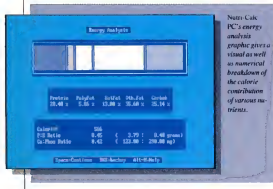
You can monitor your progress on a weekly or daily basis, and *The Diet Balancer* also lets you look up the caloric or nutritional information for any food in the database.

All three of these packages provide an effective way to oversee your diet. Of course, each has its particular strengths, and the one you choose should depend in part on your goals. *Nutri-Calc* has the best graphic-analysis function, and *The Diet Balancer* most effectively stresses exercise and weight loss. The most all-around sophisticated program, though, is *The Food Processor II*; it is an excellent combination of flexibility, ease of use, and an extensive database.

It is extremely important to remember, when using these programs, that proper nutrition is a delicate balance. As the software publishers point out, no changes in your diet should be attempted except under the supervision of a doctor.

List Price: *The Diet Balancer*, \$79. **Requires:** 512K RAM, DOS 2.1 or later. Not copy protected. Nutridata Software Corp., P.O. Box 769, Wappingers Falls, NY 12590; (800) 922-2988.

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Suggested Reserve	27000.00	Trade Amplifier	4000	
LAST TRADE		Price	1000	
Date	07/24/1987	07/25/1987	Trade Amplifier	75
Price	13.375	13.625	Buy Amplifier	22
TRADES TO DATE		AVERAGE PRICE	Buy Amplifier	25
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AFTER HOURS



FITNESS

Nutrition Databases: Changing Your Diet to Improve Your Health

BY JONATHAN MATZKIN

If you are what you eat, then I'm a slice of pizza with the works. Good nutrition has never been very high on my list of personal priorities, despite the stern admonitions of those nice people who peddle good health on the breakfast cereal commercials. My curiosity was piqued, however, by several software packages designed to plan and track food intake.

At the very least, I saw *The Food Processor II* from ESHA Research, *Nutri-Calc PC* from Camde Corp., and *The Diet Balancer* from Nutridata Software Corp. as tools that would help me assess just how unhealthy my junk-food-fueled existence really is. All three packages are essentially databases that record the nutritional and caloric content of diverse types of edibles and potables.

AFTER HOURS INDEX

The Food Processor II, *Nutri-Calc PC*, and *The Diet Balancer* for eating smart.
The 8-Week Cholesterol Cure Help in the fight against saturated fats.
Personal Health Appraisal Assessing your life-style's health risks.
Family Care A medical diagnostic aid for parents.

The Food Processor II

The Food Processor II, at \$250, is the most expensive of the three packages, and it has the slickest user interface. It also comes with the largest standard database, with nutrition and caloric information for 2,400 foods. You have a choice between the United States Department of Agriculture values for each food (Recommended Daily Allowances) or the Canadian data (Recommended Nutrient Intakes).

Before *The Food Processor II* can analyze your diet, you must enter certain basic information about yourself: your age, weight, height, gender, and level of physical activity. The program allows you to create a number of these "profiles," either for different people or for different desired weight goals for yourself.

Once the profile values are entered, the program computes the number of calories you must take in to maintain the weight you entered. The analysis also includes a breakdown of 30 essential nutrients (such as carbohydrates and vitamins) and determines how much of each you need in order to maintain a balanced diet.

Your next step is to analyze the food you eat to see how well it supplies the nutrients that you need. You select the Food List Entry Screen from the main menu and supply the name and quantity of each food to be analyzed.

The Food List Entry Screen is one of *The Food Processor's*

The Food Processor II compares all of the nutrients that you need based on the profile information that you supply.

Food	Calories	Protein	Fat	Carbs	Fiber	Calcium	Iron	Vitamins	Minerals
Apple	115	0.5	0.3	28	1.5	10	0.5	1	10
Banana	105	1.1	0.3	27	2.6	22	0.3	1	10
Orange	65	0.9	0.1	15	1.0	40	0.1	1	10
Pineapple	82	0.4	0.1	20	1.0	10	0.1	1	10
Strawberry	49	0.7	0.1	10	2.0	10	0.1	1	10
Watermelon	30	0.6	0.1	7	0.9	10	0.1	1	10
...

most flexible features. Your list of foods can contain up to 45 edibles. The software tells you the total caloric content of your listed foods and lists the amounts of each of the 30 nutrients that you take in by consuming these foods. The calorie total is broken down into percentages of protein, carbohydrates, and fats.

All of this number crunching pays off when *The Food Processor* compares what you actu-

ally ingest with your optimal nutritional intake. The resulting analysis shows the percentage of the targeted calorie total that your food list supplies.

These relationships can be graphed with a single additional keystroke. The resulting bar graph is quite rudimentary by modern standards, but it gives an effective visual representation of deficits and surpluses in your diet.

(continues)



Nutrition Databases: Summary of Features

(Products listed in ascending price order)

	The Diet Balancer	Nutri-Calc PC	The Food Processor II
List price	\$79	\$145 (\$45 for database supplement)	\$250
Allows multiple users	●	●	●
Number of foods in database	1,600	1,500 (3,000 with database supplement)	2,400
Number of nutrients factored into food breakdown	24	25	30
Saves food lists as files	○	○	●
Suitability as a weight loss tool	Excellent	Good	Good
Graphics analysis	Good	Excellent	Good
● - Yes ○ - No			

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